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A STUDY OF THE FIELD PERFORMANCE OF AN EXPERIMENTAL PORTLAND CEMENT CONCRETE PAVEMENT

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Cincinnati University

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16. Abstract

An experimental section of P.C.C. pavement on U.S. 23 in Ross County, Ohio is studied. Variables included in the study are 1) Joint spacing 2) Sub-base stabilization 3) Coating of dowel bars 4) Configuration of the saw cut and 5) the use of skewed joints.

The yearly curve of joint movement is plotted from hand gage readings. Electronic instrumentation is used to give a continuous record of daily horizontal slab movements. Deflection of the slab ends under known axle loads is measured.

A complete record to date is given of the progress of mid slab cracking. Spalling at the bottom of the pavement is measured and plotted for each of the 101 contraction joints in the project.

17. Key Words
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FINAL REPORT

A STUDY OF THE FIELD PERFORMANCE OF AN EXPERIMENTAL PORTLAND CEMENT CONCRETE PAVEMENT

by

Issam Minkarah
and
John P. Cook

Research Performed Under Agreement No. 2634
sponsored by

STATE OF OHIO
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in cooperation with

FEDERAL HIGHWAY ADMINISTRATION

May 1975

UNIVERSITY OF CINCINNATI
Cincinnati, Ohio

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The opinions expressed in this report are those of the authors and are not necessarily those of the Ohio Department of Transportation or the Federal Highway Administration.

The contents of this report reflect the views of the authors who are responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the State of Ohio, Department of Transportation, or the Federal Highway Administration. This report does not constitute a standard, specification, or regulation.

CHAPTER I

THE PROBLEM

Pavements move. The causes of this movement are expansion and contraction due to temperature and moisture changes, and wheel loadings. Portland Cement concrete pavements are usually jointed, to accommodate this movement.

The results of pavement movement may be pavement blow-ups, pavement growth, bridges tilted or pushed out of skew, and the cracking of pavement slabs, due to the loss of subgrade support.

The joints in portland cement concrete (P.C.C.) pavements are usually formed by sawing a transverse contraction slot to a depth of 1/6 "T", in which "T" is the slab thickness. This provides a weakened plane for cracking, and the drying shrinkage of the concrete causes the slab to crack through the remainder of the depth. The joint is usually bridged by a system of dowel bars which provide load transfer from one section of the slab to the next.

The movement of a pavement slab is usually assumed to be a sinusoidal variation of expansion and contraction, causing the joint to open and close. However, the actual pavement, as constructed, does not move in this smooth pattern. As the temperature changes, the pavement tends to warp. In hot weather, the top surface of the pavement expands more than the bottom surface, so that the slab tends to bow upward in the center. In cooler weather, the top surface of the slab contracts more than the bottom surface, and the slab tends to dish upward at the slab ends.

Subgrade friction also has an effect on the movement of the pavement. As the temperature rises, the slab wants to expand. However, a 40 ft. length of 24 ft. wide pavement weighs approximately 59 tons which causes a very large frictional force between slab and subgrade. Consequently, the slab movement may be incremental, rather than a smooth movement.

There are a large number of variables which may affect the behavior of a pavement and the net result is that the actual service characteristics of the pavement may be quite different from its predicted behavior.

Objectives of the Study

The ultimate objective of this research was the development of an improved contraction joint for portland cement concrete pavements. There are several factors which should improve joint performance. The intent of this program was to isolate each of these factors, and install it in a section of new pavement. The movement, the cracking pattern, and the spalling of the pavement were then monitored to determine the effect of each of these several factors.

The factors which are considered of prime importance are listed below:

1. Stabilized sub-base
2. Coating of dowel bars
3. Variation of joint spacing
4. Configuration of the saw cut
5. Use of skewed joints

There are, of course, a large number of possible combinations of these variables. The actual layout of the test pavement is described in detail in Ref. 8.

CHAPTER II

TEST PAVEMENT

The test pavement is a 3225 L.F. Section of the south bound roadway on Rt. 23 in Chillicothe, Ohio. It is a tangent section located between two bridges, built on fill ranging from 20 to 35 feet in depth. The profile of the highway provides an easy grade of -0.28% into a 600 ft. vertical curve, followed by a +2.0% grade.

The pavement is mainly reinforced portland cement concrete 24 ft. wide 9" thick laid over a granular sub-base, Grade A, 7½" thick. A 183 ft. section was left plain, with no dowels, and forward skew joints at 17 ft. spacing. The sub-base over a 776 ft. section was changed to a 4 in. layer of Asphaltic Concrete item #402.

The spacing of the joints was set at 17 ft., 21 ft., and 40 ft. Three types of dowels were used, namely: standard, plastic coated, and 3 M. The configuration of the transverse joints was also varied. We have some 1/4" standard joints, 1/4" joints with 1/8" bevel on each side, and 1/2" saw cut.

Table I shows the location and type of the different variables introduced in the test pavement. A cross-section of the test pavement with all the variables introduced is shown in Fig. II-1, II-2 and II-3 for easy reference.

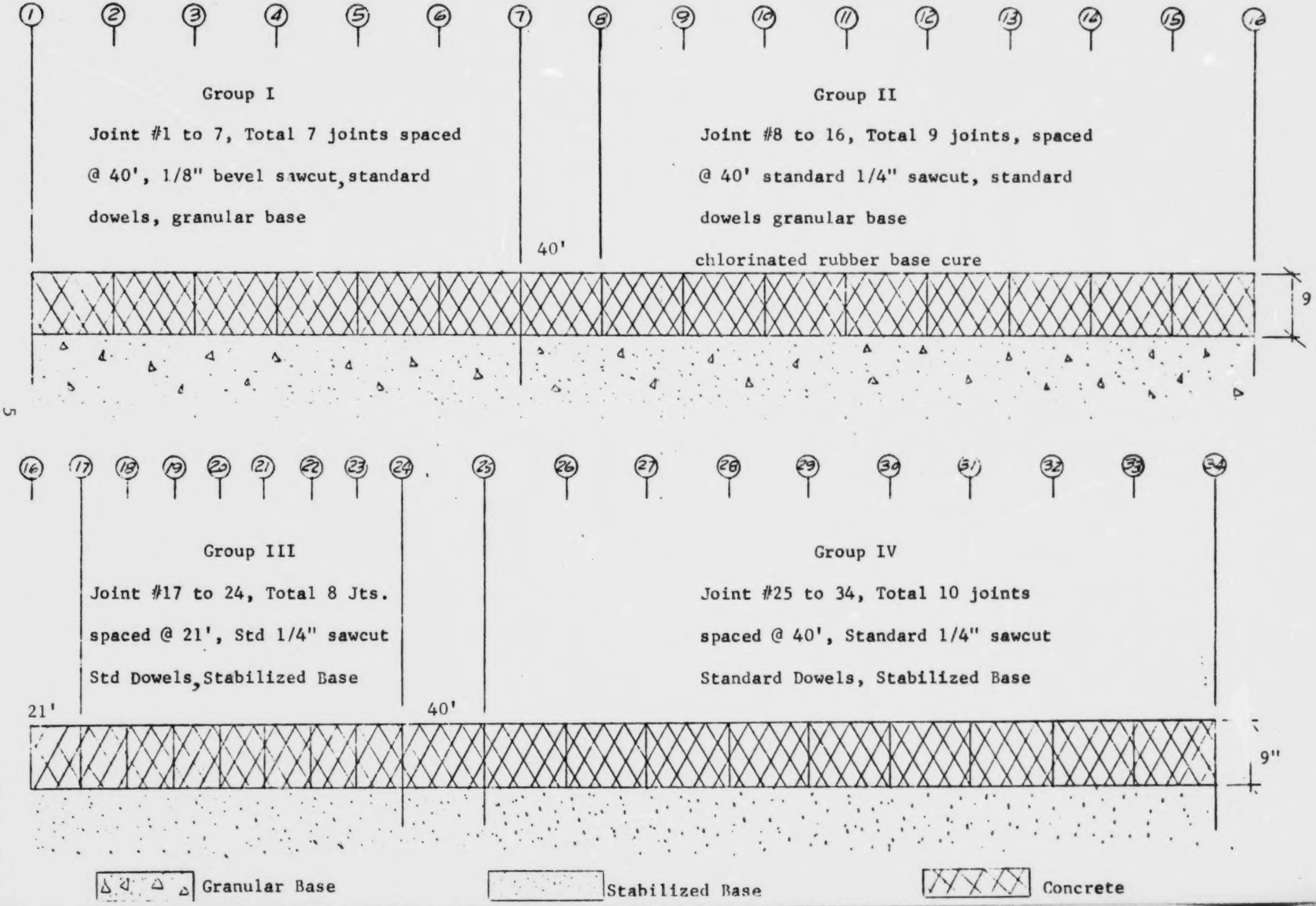
Table I

Joint Groups

Group Nos.	Joint Nos.	Total # of Joints	Type of Joint	Spacing	Type of Subbase	Type of Dowels	Remarks
I	1 to 7	7	1/8" bevel sawcut	40'	Granular	Standard	
II	8 to 16	9	Std. 1/4" sawcut	40'	Granular	Standard	chlorinated rubber base cure
III	17 to 24	8	Std. 1/4" sawcut	21'	Stabilized	Standard	
IV	25 to 34	10	Std. 1/4" sawcut	40'	Stabilized	Standard	
V	35 to 44	10	Std. 1/4" sawcut	17'	Stabilized	No dowels	right forward skew & plain pavement
VI	45 to 53	9	Std. 1/4" sawcut	21'	Granular	Plastic coated	
VII	54 to 63	10	Std. 1/4" sawcut	40'	Granular	Plastic coated	
VIII	64 to 73	10	1/2" sawed	40'	Granular	Standard	
IX	74 to 84	11	Std. 1/4" sawcut	40'	Granular	Standard	
X	85 to 94	10	Std. 1/4" sawed	21'	Granular	Standard	
	95 and 96	2	Std. 1/4" sawed	40'	Granular	3M coated	
	97 to 100	4	Std. 1/4" sawed	40'	Granular	Standard	
	101	1	Expansion	40'	Granular		

Fig. II - 1

PAVEMENT CROSS SECTION


1
2
3
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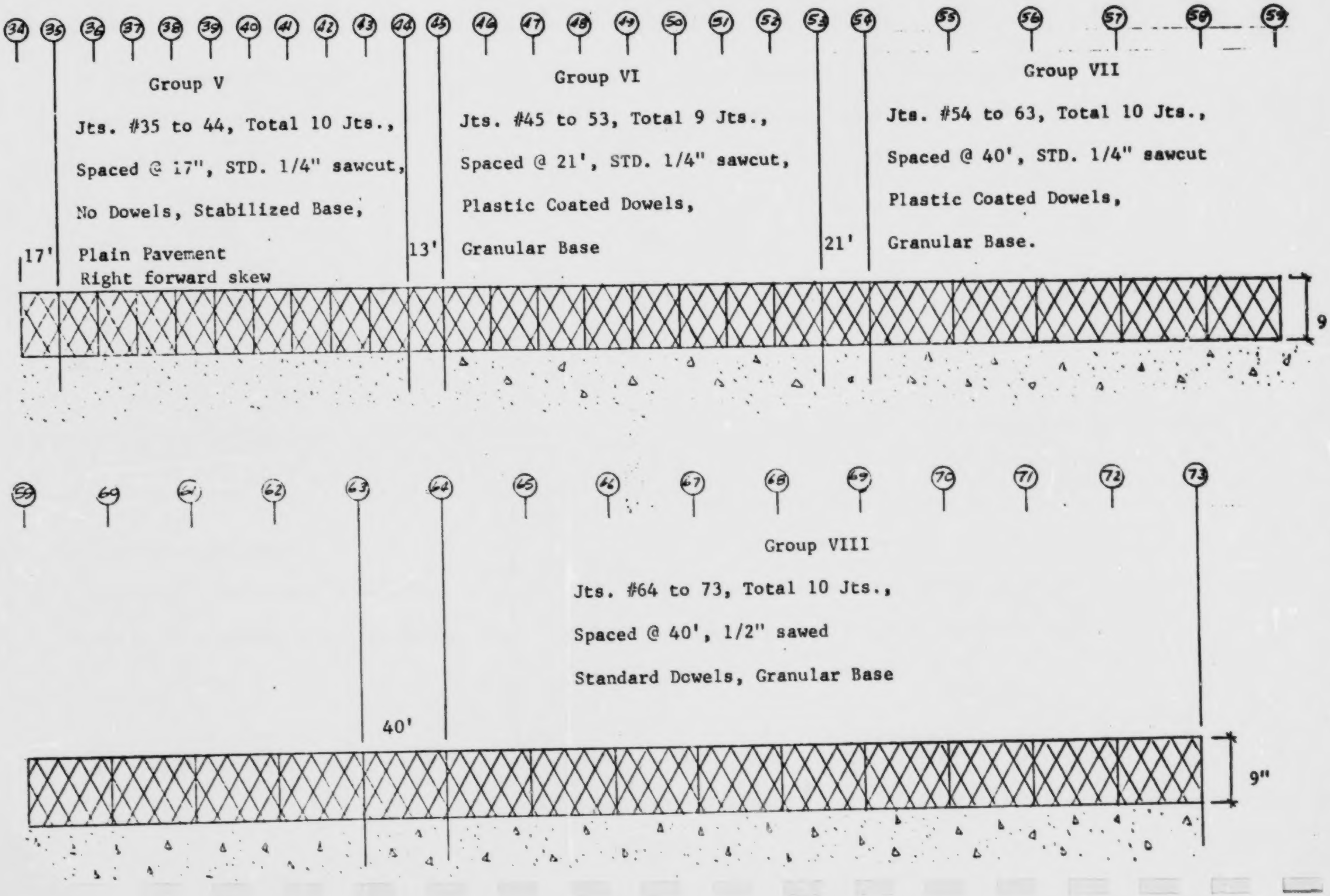
6
7
8
9
10
11
12
13
14
15
16
Group I
Joint #1 to 7, Total 7 joints spaced @ 40', 1/8" bevel sawcut, standard dowels, granular base
Group II
Joint #8 to 16, Total 9 joints, spaced @ 40' standard 1/4" sawcut, standard dowels granular base
40'
chlorinated rubber base cure
9
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
Group III
Joint #17 to 24, Total 8 Jts. spaced @ 21', Std 1/4" sawcut Std Dowels, Stabilized Base
Group IV
Joint #25 to 34, Total 10 joints spaced @ 40', Standard 1/4" sawcut Standard Dowels, Stabilized Base
21'
40'
9"
Granular Base
Stabilized Base
Concrete

Fig. II - 2

PAVEMENT CROSS SECTION


34
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44
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48
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50
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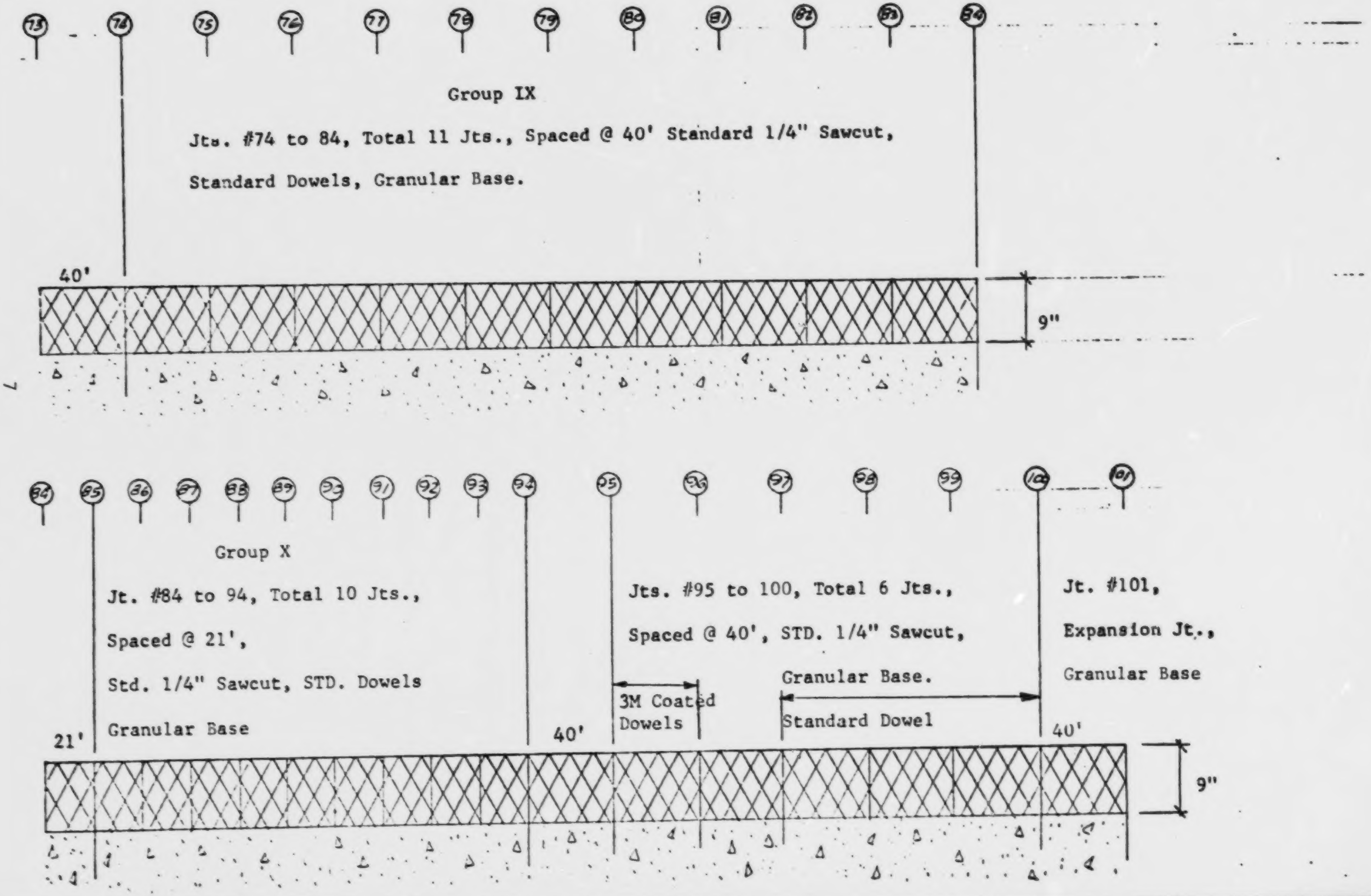
52
53
54
55
56
57
58
59
Group V
Jts. #35 to 44, Total 10 Jts.,
Spaced @ 17", STD. 1/4" sawcut,
No Dowels, Stabilized Base,
Plain Pavement
Right forward skew
17'
13'
Group VI
Jts. #45 to 53, Total 9 Jts.,
Spaced @ 21', STD. 1/4" sawcut,
Plastic Coated Dowels,
Granular Base
21'
Group VII
Jts. #54 to 63, Total 10 Jts.,
Spaced @ 40', STD. 1/4" sawcut
Plastic Coated Dowels,
Granular Base.
9
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
Group VIII
Jts. #64 to 73, Total 10 Jts.,
Spaced @ 40', 1/2" sawed
Standard Dowels, Granular Base
40'
9"

Fig. II - 3

PAVEMENT CROSS SECTION


73
74
75
76
77
78
79
80
81
82
83
84
40'
9"
84
85
86
87
88
89
90
91
92
93
94
95
96
97
98
99
100
101
21'
40'
3M Coated Dowels
Standard Dowel
40'
9"

Group IX

Jts. #74 to 84, Total 11 Jts., Spaced @ 40' Standard 1/4" Sawcut, Standard Dowels, Granular Base.

Group X

Jt. #84 to 94, Total 10 Jts.,
Spaced @ 21',
Std. 1/4" Sawcut, STD. Dowels
Granular Base

Jts. #95 to 100, Total 6 Jts.,
Spaced @ 40', STD. 1/4" Sawcut,
Granular Base.

Jt. #101,
Expansion Jt.,
Granular Base

CHAPTER III

INSTRUMENTATION

Four types of measurements were made:

1. Hand gage measurements of horizontal movement were made monthly over the entire length of the project.
2. Electronic measurements of horizontal movement were made on groups of joints. These measurements were conducted on each set of joints, continuously for one week.
3. Electronic measurements of vertical movement were made on one joint in each group, during every season of the year.
4. The spalling at the joints and the cracking patterns in the pavement were measured bi-monthly starting on March 25, 1974. Previous to this date the spalling of the joints and the cracking patterns of the pavement were monitored monthly.

The instrumentation for hand gage measurements, electronic vertical measurements and calibration is described in detail in Reference 8. The only change in instrumentation made was in electronic horizontal measurements.

Electronic Measurements - Horizontal

The horizontal movement was measured with 1 megohm Bournes Linear Motion Transducers, Model 3049L.

The transducers were mounted on the side of the slab, at mid-depth and not on the riding surface.

Each joint was fitted with a drilled and tapped aluminum plate on one side of the joint and a short section of 1½" x 1½" aluminum angle on the other side of the joint. The aluminum plate fitted into the pavement has only six holes in it which limited the mounting of the transducers to three positions. To allow more leeway in positioning the transducers, a new aluminum angle with 17 closely spaced holes was attached with screws to the original plate. The transducers could then be screwed directly on to the angle on one side of the joint, so that the probe of the transducer was in contact with the aluminum angle on the other side of the joint. By adjusting the position of the transducer at the joint, the marker on the recorder could be set close to the middle of the chart, thus leaving enough margin for expansion and contraction.

The transducers were connected to double channel recorders, Model No. 291, so that one recorder could serve two transducers. A resistor was connected to the recorder in series with the transducer to limit the current from the 12 V. batteries to 50 micro amps which is the full range of each channel. This system was the least expensive of all alternatives.

The zero controls originally used with the recorders to center the marker were discarded, since centering can now be achieved by a proper positioning of the transducer. The calibration curves, thus, became simpler, having one curve for each channel and transducer rather than several curves depending on the positioning of the marker by using the controls. The calibration curves are shown in Figures V-150 to V-157.

One recorder had one channel calibrated for a motion transducer and the other channel calibrated for a temperature sensor. The temperature sensor is a Model No. 1441 from Yellow Springs Instrument Company. The sensor is calibrated from -10F to +150F. This temperature sensor is mounted in a hole drilled at the mid-depth of the slab.

All strip chart recorders have a chart speed of 1/4 inch per hour, so that one week of continuous readings on a given set of joints is obtained in a 42 inch length of chart paper.

Hand gage measurements were made in the driving lane and the electronic measurements in the passing lane.

The joints were arranged in groups as explained in Chapter II. Within each ten joint group, the joints were wired in pairs, so that one recorder could serve two joints. A short section of 4 lb. sign post was driven into the berm midway between two joints to serve as an anchoring post. At each joint, the shoulder material was excavated down to the bottom of the slab. Each joint was filled with a cut-out box, made of sheet metal, complete with cover. Permanent wires were installed underground. One end of each set of wires terminated inside the cut out box at each joint. The other ends of the wires came out of the ground in the berm, adjacent to the anchoring post. The recorder, and a 12 V. battery to power the recorder served as a unit for each pair of joints. The entire unit was enclosed in a water tight welded aluminum box, which was bolted to the anchoring post and then locked.

The installation procedure for each set of joints was as follows:

1. Screw the transducer to the mounting angle on the side of the slab and connect the transducer lead wires to the permanent wires already in place in the cut-out. Position the transducer in such a way so that the marker on the recorder is centered.
2. Insert the temperature sensor into the hole at mid-depth of the slab and connect the sensor lead wires to the permanent wires in place in the cut-out.
3. Mount the equipment box on the anchoring post.
4. Connect the proper joint wires from each of the two joints to the proper controls on the recorder.
5. Connect the recorder and transducers to the battery.

Each time a set of readings was taken, both the air temperature and the pavement surface temperature were recorded. The pavement surface thermometer was a Pandux surface temperature thermometer, Model No. 309F. This thermometer was graduated from -50F to +250F.

CHAPTER IV

FIELD MEASUREMENTS

Four Types of measurement of pavement movement were made.

1. Hand gage measurements were made monthly over the entire length of the project.
2. Electronic measurements of horizontal movement were made on groups of joints.
3. Electronic measurements of vertical movement were made on one joint in each of several groups.
4. Hand measurements of spalling and cracking.

Hand Gage Measurements

To maintain a complete history of the horizontal movement of the pavement all 101 joints in the project were measured monthly for a period of one year. The gage and the brass plugs used are described in Chapter III of Ref. 8.

At the time the hand gage measurements were taken, both air temperature and the pavement surface temperature were recorded.

Graphs of the horizontal movements for the years 1973 & 1974 are shown in Figures V-1 to V-58.

Electronic Measurements - Horizontal

The original work plan called for three complete sets of measurements covering the joint groups shown in Table I, Chapter II. Unfortunately, due to unreasonable delays in receiving the equipment and spare parts ordered for the test coupled with a flash flood in June that damaged our recorders, we were able to complete only two sets.

Instrumentation was left on each joint group for a period of one week. Since 11 groups were instrumented, the recording instruments spent a period of 11 continuous weeks at the test site. At the end of this period which effectively used up one season of the year, the instruments were returned to the laboratory. At this time all new transducers were installed and all instruments were re-calibrated. Typical calibration curves are shown in Chapter V. After a two week period of clean-up and re-calibration, the instruments were returned to the field for the next 11 weeks. Typical curves of Horizontal Movement are shown in Figures V-59 to V-64.

Vertical Movement Measurements

Measurements of vertical pavement deflection under load were made on the following joints:

Joint No. 4	40 ft. spacing	granular base	standard dowel
Joint No. 12	40 ft. spacing	granular base	standard dowel
Joint No. 21	21 ft. spacing	stabilized base	standard dowel
Joint No. 29	40 ft. spacing	stabilized base	standard dowel
Joint No. 40	17 ft. spacing	plain pavement with skewed joints	
		stabilized base	no dowels
Joint No. 49	21 ft. spacing	granular base	coated dowels
Joint No. 59	40 ft. spacing	granular base	coated dowels
Joint No. 69	40 ft. spacing	granular base	standard dowels
Joint No. 78	40 ft. spacing	granular base	standard dowel
Joint No. 89	21 ft. spacing	granular base	standard dowel
Joint No. 98	40 ft. spacing	granular base	standard dowel

The measurements were each taken twice, once early in the morning on a relatively cool pavement and again later in the day when the pavement was quite hot. These measurements were taken during the Fall, Winter and Summer seasons.

Previous research has indicated that random automobile traffic produces little, if any, noticeable deflection. Random truck traffic causes some deflection, but lacks calibration. Consequently, a loaded dump truck with known axle loads was used. The truck used had a single rear axle with an approximate weight distribution of one-third to the front wheels and two-thirds to the rear wheels. The truck was weighed after loading and the axle loads are shown on the vertical deflection curves in Chapter V. The truck made a sequence of 3 runs over the test joint as follows:

55 mph in the center of the passing lane
55 mph at the edge of the passing lane
10 mph at the edge of the passing lane

The entire sequence was repeated morning and afternoon. Curves of vertical movements are shown in Figures V-65 to V-108.

Hand Measurements of Spalling and Cracking

As the monthly hand gage measurements were being made, the investigators necessarily had to walk the entire length of the project, which provided an ideal time to inspect the entire length of the project for cracks. The length and location of every crack noticed were measured.

Spalling was being monitored weekly while instrumenting the joints for electronic horizontal measurements. The first sign of spalling was noticed in joint No. 33 on January 11, 1974. A spot check on several joints revealed no spalling.

By mid-March the spalling of the joints and the cracking of the pavement had increased to such an extent that a separate program for measurement was initiated. The first complete set of measurement was taken on March 25, 1974 and every other month since. The condition of the pavement on September 4, 1974 is shown in Figures V-109 to V-149.

CHAPTER V

RESULTS

Horizontal Movement

Horizontal movements of the pavement were measured monthly with the hand gage and for one week periods using the electronic instrumentation.

The hand gage readings give the yearly movement of the pavement, which is roughly sinusoidal. Figures V-1 through V-58 show the yearly movement of the 101 joints in the project. Where possible these curves for 1974 were plotted on the same sheets with the 1973 curves, so that an immediate comparison can be made of the movement during these two yearly cycles. It was necessary to plot new curves for 1974 for the joints 1 through 11, because this section of pavement shows much larger movements in 1974 than in 1973. It cannot be coincidence that the Eastern Avenue approach ramp abuts the main line slab from joints 1 through 11.

These hand gage readings lend themselves readily to a statistical analysis. Table V-1 is a compilation of the test sections with the standard deviation and the coefficient of variation tabulated for each joint group.

The computed joint movements were found by using a coefficient of expansion of 6.0×10^{-6} inches per inch per degree for the concrete.

This statistical evaluation still fails to show any definite pattern. Groups III, IV and V which are on stabilized base have coefficients of variation ranging from 15 to 28. Interestingly, the skew joints (Group V) show one of the higher coefficients. In 1973, this same group had one of the lowest coefficients of variation. The one fact which stands out starkly is the extremely high coefficient in Group II. The Eastern Avenue approach ramp abuts the main line slab for about half of the joints in this group.

Table V-1

Movement of Pavement Contraction Joints
December to June, 1974
Temperature Differential - 55°F

Group No.	Joint spacing, ft.	No. of Joints	Change in Joint Widths (in thousandths of inch)			Coeff. of Variation, percent
			Computed	Measured Average	Standard Deviation	
I	40	7	158	67	13	19
II	40	9	158	108	87	80
III	21	8	83	53	9	17
IV	40	10	158	86	10	15
V	17 skewed	10	67	36	10	28
VI	21	9	83	44	8	18
VII	40	10	158	71	17	24
VIII	40	10	158	76	28	37
IX	40	11	158	77	12	16
X	21	10	83	44	11	25

In plotting the hand gage curves, the October 25th reading of the joint was taken as the datum line and joint movements were measured plus and minus from this reference.

Group I (joints 1 through 7) shows large movements. Only joints 2 and 7 are behaving close to the expected performance. This section shows extensive midslab cracking but the cracks are apparently not working cracks. The joints are showing the movement.

Group II shows two distinct patterns of behavior. Those joints at the beginning of the section abutted by the approach lane show large movements. The remainder of the joints in the group are well behaved.

Group III is a well behaved group of joints. All joints appear to be functioning well. The group has one of the lowest standard deviations.

Group IV (joints 25 through 34) is on stabilized base, with 40 ft. spacing and standard dowels. This group has the lowest coefficient of variation for 1974. A study of the curves shows all the joints taking movement in a very consistent pattern.

Group V is plain pavement with 17 ft. skewed joints on stabilized base. There are no dowels. This group depends on aggregate interlock for load transfer. This group has a 28 percent coefficient of variation for 1974. While this percentage is not excessive, it is up sharply from the 16 percent recorded in 1973. Note that joint 42 actually closed in December while the rest of the joints in the group were opening.

Group VI has a 21 ft. joint spacing and is built on granular base with plastic coated dowels. This group had the highest coefficient of variation in 1973 but one of the lowest in 1974. Joint 51 which showed a very erratic jump in the winter of 1973 was well behaved in 1974.

Group VII also has plastic coated dowels but has a 40 ft. joint spacing. The C.V. is moderate, and joint no. 55, which was a maverick performer in 1973 has settled into a pattern of regular movement. Joint 58 is interesting. It showed little movement in 1973 and continued this pattern until December of 1974 when it began to move in a regular pattern. Joint 60 which showed wide swings in 1973 also settled into a regular pattern in 1974.

Group VIII is similar in construction to Group I, II and IX except that it has a 1/2 inch sawcut joint. The C.V., at 37 percent, is up markedly from 1973. Much of this might be attributed to joint 73. In this joint the brass plug was set too deep on one side of the joint. The data were taken for 1974, but the accuracy of the readings is questionable.

Group IX is the control set of joints which uses 40 ft. spacing on granular base with standard dowels. The C.V. which is based on December to June is quite low, but a study of the curves shows that joint 75 closed 1/8 inch between December and January and then opened 1/8 inch between January and April. Joint 79 showed the same swing of movements.

Group X is similar to Group IX except for the 21 ft. joint spacing. The pattern of movement for 1974 is almost identical to 1973. Again all values are well clustered about the measured average, except for joint 92, which takes excessive movements.

Joints 95 and 96 contain the 3M coated dowels. These joints appear to be functioning quite normally.

The expansion joints appear to be taking less movement in 1974 than in 1973.

Electronic Measurements - Horizontal

Figures V-59 through V-64 show typical curves for the daily movement of the slabs, as taken from the strip chart recorders and replotted.

Typical curves are shown from Groups I, IV, V, VI, VII and IX. These groups cover the major parameters involved in the program. Note that in plotting these movement and temperature curves, the midslab temperature of the time the instruments were removed is used as the base temperature. Movement is plotted against temperature change, not against absolute temperature.

Group I. Joints 2 and 4 are shown because they are typical of the group. Note the similarity between these curves and the yearly movement curves for these two joints. Joint 2 moves less than the average while joint 4 moves in big swings, following the temperature.

Group IV. Joints 27 and 29 both take a large movement jump from 6 P.M. on May 17 to 6 A.M. on May 18. Note that this jump is fully as large as the yearly cycle. Beginning on May 18 both joints show little movement for the next three days.

Group V has the 17 ft. spacing. Joints 41 and 42 are shown. Each of these joints takes one large movement swing during the week shown. From May 25 on, these joints do show every other joint taking movement, one joint is closing while the other is opening.

Group VI. Joints 47 and 50 are shown because these two, on a daily basis, seem to be taking up the majority of the movement. It is important to note that the yearly movement curves show both of these joints as having quite regular movements. The daily swings however, are quite large. Note that joint 50 begins a closing trend at 6 A.M. on May 31 which continues for the rest of the week recorded.

Group VII. Joint 56 takes far more than the average of the group. Joint 58 indicates the existence of some subgrade friction. This joint makes its moves in increments followed by rather long stationary periods.

Group IX. Joints 76 and 79 are shown. Joint 76 follows the temperature curve quite nicely. Joint 79 remained almost stationary from June 18 to June 22 even though the midslab temperature varied almost 30 degrees at times. This set of readings was aborted after 4½ days due to the flooding of Paint Creek which inundated all the equipment.

Summary of Horizontal Movements

1. The yearly movement curves which are point by point readings taken each month show up as smooth curves which are roughly sinusoidal. The continuous electronic plots show that the majority of joints move in a "stick and slip" type of pattern.

2. The hand gage measurements were almost always taken at noon or slightly after. Examination of the daily curves shows this point to be fairly close to

a median, between the daily high and daily low. This helps to smooth out the yearly curves.

3. There is no definite pattern throughout the project of every other joint taking the movement. We can point to isolated incidences where this behavior occurred, such as joints 41 and 42 from May 25 to May 28.

4. The "stick and slip" type of movement occurs, whether the joint group is on granular or stabilized base. This is surprising. The investigators expected the joints on stabilized base to move more freely and follow the temperature curves more closely.

5. Another surprising point is the magnitude of the daily movements. After resting for a while a particular slab may move 1/4 inch within a 6 hour period. An example of this is joint no. 58 on June 6.

6. Joint spacing does not appear to be a determining factor in the magnitude of the daily movements. Groups IV, V and VI, which represent all three of the spacings in the project all show daily jumps of approximately the same magnitude.

7. Very important. None of the joints are frozen. All joints are moving. This would indicate that the joint seals are functioning fairly well.

Vertical Movement

Figures V-65 through V-108 show the effect of the various parameters on vertical pavement deflection. Measurements were made by mounting the transducer on the passing lane side of the pavement. Consequently the deflections are always greater when the test vehicle was close to the edge of the pavement (runs 2 and 3 in each set). Also deflections were naturally greater with the vehicle operating at low speeds.

Every joint shows the effects of morning to afternoon temperature variation. Readings taken early in the morning are always larger than the corresponding readings taken in mid-afternoon. This seems natural, since in the morning the joints have opened somewhat. Also, the top surface of the pavement is cooler than the bottom, causing the slab ends, of the joint, to curl upwards. This curl, or differential between top and bottom of the slab appears to be the dominating effect of temperature. The joint width, as controlled by temperature, seems to be a minor effect, because almost all the readings in the summer are higher than the corresponding readings in the colder months of the year.

The highest deflections are shown in the sections on granular base. The highest single reading was joint No. 69 with a reading of 0.067 in. in August. This joint has a 1/2 inch sawcut, 40 ft. slab length, granular base and standard dowels.

The effect of the plastic dowel coating is not readily apparent. Three joints, 59, 69 and 78 are all on granular base with 40 ft. spacing. Joint No. 59 has the plastic coated dowel and the other two have standard dowels. Joint No. 69 (standard dowel) shows the highest deflection, in the summer set of readings. Joint No. 78, also with standard dowels, is the lowest of the three. The plastic coated dowel joint (No. 59) falls between the other two. Tentatively it can be said that the plastic coated dowels are behaving at least as well as the standard dowels.

In a previous report (8), the effect of joint spacing on vertical deflection showed, rather surprisingly, to be negligible. In this current work the effect of joint spacings seems to be swinging in the other direction, so that the larger joint spacings produce larger deflections. In the winter set of readings Joint No. 59 (40 ft. spacing) is about 30% higher than Joint No. 49 (21 ft. spacing). Also Joint No. 78 (40 ft.) deflects almost twice as much as Joint No. 89 (21 ft.). Summer readings of these two pairs of joints show the same result.

Note that all four of these joints are built on granular base.

A comparison of Joints 21, 29 and 40 in the summer set of readings, is interesting but not conclusive. All of these joints are on stabilized base. The largest deflections are in Joint No. 40 (plain pavement, no dowels, 17 ft. spacing). The smallest deflection of the three is Joint No. 29 (40 ft. spacing, standard dowel). Joint No. 21 (21 ft. spacing, standard dowel) falls between the other two. On the stabilized base then, joint spacing does not appear to be a dominating factor.

Summary of Vertical Deflections

1. Temperature differential between morning and afternoon still appears to be the dominating factor. Readings taken on the pavement in the morning when the surface temperature is at or below subgrade temperature are 3 or 4 times greater than deflections taken in the afternoon when the pavement temperature is at or above the subgrade temperature. Note figures V-78 and V-79. The temperature from A.M. to P.M. changed very little and so did the deflections.

2. Pavement curl, rather than the absolute width of joint opening is the dominating temperature effect. This is shown by the fact that the summer series readings are substantially larger than the winter readings on the same joints. In summer, the differential between subgrade and surface temperature, is much greater than in winter.

3. Longer joint spacings, at least on granular base are beginning to show larger deflections than the shorter spacings. The reverse seems to be true on stabilized base. This will be an interesting point to watch in the forth coming year.

4. Surprisingly, the deflections in Joint No. 40, which depends on aggregate interlock, do not increase during the cold months of the year.

5. Comparison of this current work with the previous report do not show any definite trend towards "pocketing" of the dowels. Vertical deflections up to this time, are not showing a definite increase with time and traffic.

Cracking and Spalling

The section of pavement being monitored was completed in the summer of 1972. The first sign of cracking was noted in April 1972. A full survey on May 1, 1973 revealed a total of 12 small cracks in the entire test section. The cracks started in the driving lane next to the shoulder. Some were so small in size that we could not find them on subsequent monthly surveys. The number of cracks increased to 19 in June, 25 in mid-July and did not become appreciable until the pattern shown in Fig. V-109 through V-149 began to take shape.

The cracks progressed, in general, from the driving lane shoulder to the longitudinal joint, becoming somewhat wider and probably deeper with time. By Dec. 6, 1973, there were five 12 ft. long cracks and ten more cracks which had progressed across both lanes. The cracks usually progressed steadily from the driving lane shoulder to cross both lanes, but in some instances cracks would commence at both shoulders and meet at the longitudinal joint. This number of cracks did not increase appreciably until the fall of 1974. In Sept. of 1974, there were 16 cracks across one lane only and an additional 17 cracks across both lanes. We do not know if these are full depth cracks. The fact that the 40 ft. slabs are giving larger vertical deflections under load than the shorter sections, leads us to believe that these, in most cases, are not full depth cracks.

The surface of the pavement is still in excellent condition with no signs of surface spalling except at the junction of the transverse joint and the shoulder joint. An exchange of information with Barksdale and Tons who are working on the NCHRP Shoulder Joint Project reveals that this type of distress is widespread throughout the country. The only other sign of distress in the pavement surface was caused during construction. At several spots along the pavement the roller which was compacting the shoulder strayed over on to the edge of the P.C.C. pavement and crushed the concrete at the longitudinal shoulder joint.

The cracking and spalling at the junction of the transverse and shoulder joints was first noticed in May of 1973. By February of 1974, 2/3 of the joints in the test section showed this type of distress. At this junction point, the preformed joint seal is usually slightly displaced or distorted.

The side of the pavement in the passing lane is kept open for a distance of approximately 6 to 8 inches at each joint, so the electronic instrumentation can be attached to the side of the slab. These openings enabled us to watch closely for any spalling at the bottom of the contraction joints. The first evidence of such spalling was noted in Joint No. 33 in January 1974. An immediate spot check of other joints showed that the problem at that time was not widespread. A complete check of all joints in May 1974 showed bottom spalling in 30% of the joints, which increased to 65% of the joints by September 1974. See Figures V-109 through V-149, for the extent and location of the spalling. This spalling begins on the side of the pavement close to the bottom of the joint. This side surface spalling is followed by some loss of subgrade support, and then the breaking off of the concrete at the bottom of the joint. The possibility does exist that removing the shoulder material adjacent to each joint for the purpose of instrumentation is a contributing factor to the loss of subgrade supports. This will be checked. Several joints on the passing lane side have been kept undisturbed for this purpose. Spot checks will also be made on the driving lane side.

The bottom spalling in joints 41, 42 and 43 became so severe that the pavement was cored to determine that extent of the spalling. Cores were taken 3 ft. back from each of these joints in the obtuse angle of the skew. All the cores were full depth and devoid of any cracking, so that the problem is still quite localized.

Cracking Summary

1. Stablized Base - No cracks in these sections of pavement.

2. Granular Base - 61% of the slabs show at least one crack. Most of the cracks are in the 40 ft. sections.

3. Slab 15 - 16 - The type of base changes in this slab section and two cracks have formed.

4. Twenty one ft. spacing - There are 25 spans of this type. Only one crack to date which formed in the summer of 1973. There is also one crack in span 13-14 which has a bastard slab length of 25 ft. Both of these cracks may be due to workmanship, although both are over granular base.

5. Skew Joints - 17 ft. spacing - No cracks

6. Forty foot slab lengths - No cracking over stabilized base. 84% cracking on granular base.

7. The 40 ft. spans are further subdivided as follows:

Section between Joints No. 1 and 13. This section immediately follows a bridge and also the Eastern Avenue approach ramp abuts the main line slab in this area. This section is heavily cracked. See the figures for the extent of the cracking. This is not an isolated phenomenon. Virtually every interchange on I-71 between Columbus and Cincinnati shows this same cracking pattern whenever an approach ramp abuts the main line slab.

Section from Joint 97 to Joint 100. This section immediately precedes a bridge and is covered with hairline cracks. The length of this section is 126 ft. Larger cracks are seen in slab 97-98.

Of the remaining 34 spans of 40 ft. length, 8 show no cracks and 2 have one small crack. The newest crack was noticed in span 82-83 in September 1974. The way these spans are progressing leads us to believe that before long every 40 ft. slab on granular base will have at least one full length mid-slab crack.

Twelve spans have cracked across both lanes by September 1974. The one lane cracks are growing and will probably soon progress across both lanes.

The pavement on granular base seems to show a preference for joint spacing less than 40 ft., although the joint measurements cannot yet pinpoint these as working cracks. Interestingly, about 80% of the 40 ft. spans have only one crack close to midslab. Once this forms, new cracks do not soon develop. Spans 57-58 and 95-96 are an exception to this generalization, so this point will be closely watched in the future.

Bottom Spalling Summary

1. Type of subbase does not seem to affect the spalling. This is surprising. We expected to find more bottom spalling over the granular base.

2. Twenty one ft. joint spacing. Out of a total of 26 joints, there is no spalling in 15, moderate spalling in 7 and spalling beginning in 4.

3. Forty ft. joint spacing. 77% of these joints have spalling, ranging from slight to severe. Out of 61 joints, there is severe spalling in 8. Joint spacing does seem to be a determining factor in bottom spalling.

3. Type of Dowels. There is no appreciable difference in the sections with standard and plastic coated dowels. The absence of dowels may be contributing to the severe spalling in joints 41, 42, 43 and 44. These skew joints interestingly show the largest vertical deflections of the sections on stabilized base. The skew may also be contributing to the spalling, but unfortunately we

have no other skew section for comparison.

4. Except for Group V, as noted above, the magnitude of vertical deflection does not correlate well with the bottom spalling. The largest single vertical deflection was in joint 69 which is in a group that shows a very low amount of spalling.

5. The progression of the spalling was watched closely over a 6 month period. The joints with the 17 ft. skew spacing show the most severe spalling. It began first in joint 35 and the rest of the group followed very shortly. Spalling progresses rapidly in this section.

The 21 ft. joints. show a very slow progression of spalling. There is no severe spalling in this group.

The 40 ft. joints spall somewhat faster than the 21 ft. spans. 21% of these joints progressed appreciably over the observation period.

CHAPTER VI

CONCLUSIONS AND RECOMMENDATIONS

The objective of the project has been to study the field performance of an experimental pavement. Since this pavement was specially constructed for a previous project(8), these conclusions where possible will be correlated with the earlier report.

The surface condition of the pavement is still excellent, which undoubtedly resulted from high quality construction. The exception to this would be the crushing of some sections of the pavement edge by the steel roller while compacting the shoulder.

There is almost no spalling of the top surface of the pavement except some delta shaped spalling at the junction of the transverse joints with the longitudinal shoulder joints.

A study of the history of pavement joints(9) shows that the first slabs were short and then were greatly lengthened after WWII when most states had switched over from plain to reinforced pavement. Since about 1960, joint spacings nationally have begun to shorten. Apparently there is good reason for shortening the spacing, because most of our 40 ft. slabs now have a mid-slab crack and the progression leads us to believe that every 40 ft. slab on granular base will crack before much longer.

After 2½ years of life, these cracks do not yet seem to be working cracks. The joints are taking the movement.

The slabs mostly show a "stick and slip" type of movement. The movement which may take place in 6 to 12 hours is in many cases fully as large as the total yearly movement of the joint.

There is not yet any pattern of every other joint taking the movement. No joints are frozen. All joints are working.

The slabs abutted by the Eastern Avenue ramp are heavily cracked.

Subgrade. There are no cracks in the sections on stabilized base. Vertical deflections are lower in the sections on stabilized base. However, the subbase type seems to have little or no effect on the spalling of the bottom of the pavement.

Coated Dowels. The coated dowels are performing satisfactorily. Up to this time, no conclusions can be drawn about their ultimate worth. Only time will tell.

Pavement-Shoulder Joint. The pavement-shoulder joint should be effectively sealed to prevent the infiltration of surface water, so as to reduce the occurrence of pavement pumping and the heaving and settlement of shoulders. Barksdale and Tons (NCHRP 14-3) are currently studying this problem on a national basis. Their findings should be of great value on this subject.

Damage to this shoulder joint is often attributed to carelessness during construction. The steel roller compacting the shoulder may stray on to the edge of the PCC pavement and crush the PCC pavement edge. This crushing makes the pavement-shoulder joint very difficult to seal. There are several sections of the test pavement which have been crushed in this manner.

Recommendations.

1. The cracking and bottom spalling of the pavement should be watched quite closely and measured for an extended period of time.
2. The delta shaped spalling at the junction of the transverse contraction joint and the longitudinal shoulder joint might be prevented by running the preformed joint seal down the side of the slab. It is recommended that this be tried on an experimental basis on some future paving contract.
3. It is recommended that the Ohio DOT re-work the details of construction procedure for asphalt shoulders, to prevent the damage to the shoulder

joint noted on this contract.

4. Most of the 40 foot slabs have at least a midslab crack. It is recommended that the width of these cracks and the movement of the adjacent joints be checked very closely. This will show whether or not these are "working cracks". This information could be one of the major determining factors in the question of shortening the existing standard 40 foot joint spacing.

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K•E 10 X 10 TO ½ INCH 7 X 10 INCHES KEUFFEL & ESSER CO. MADE IN U.S.A.

46 1320

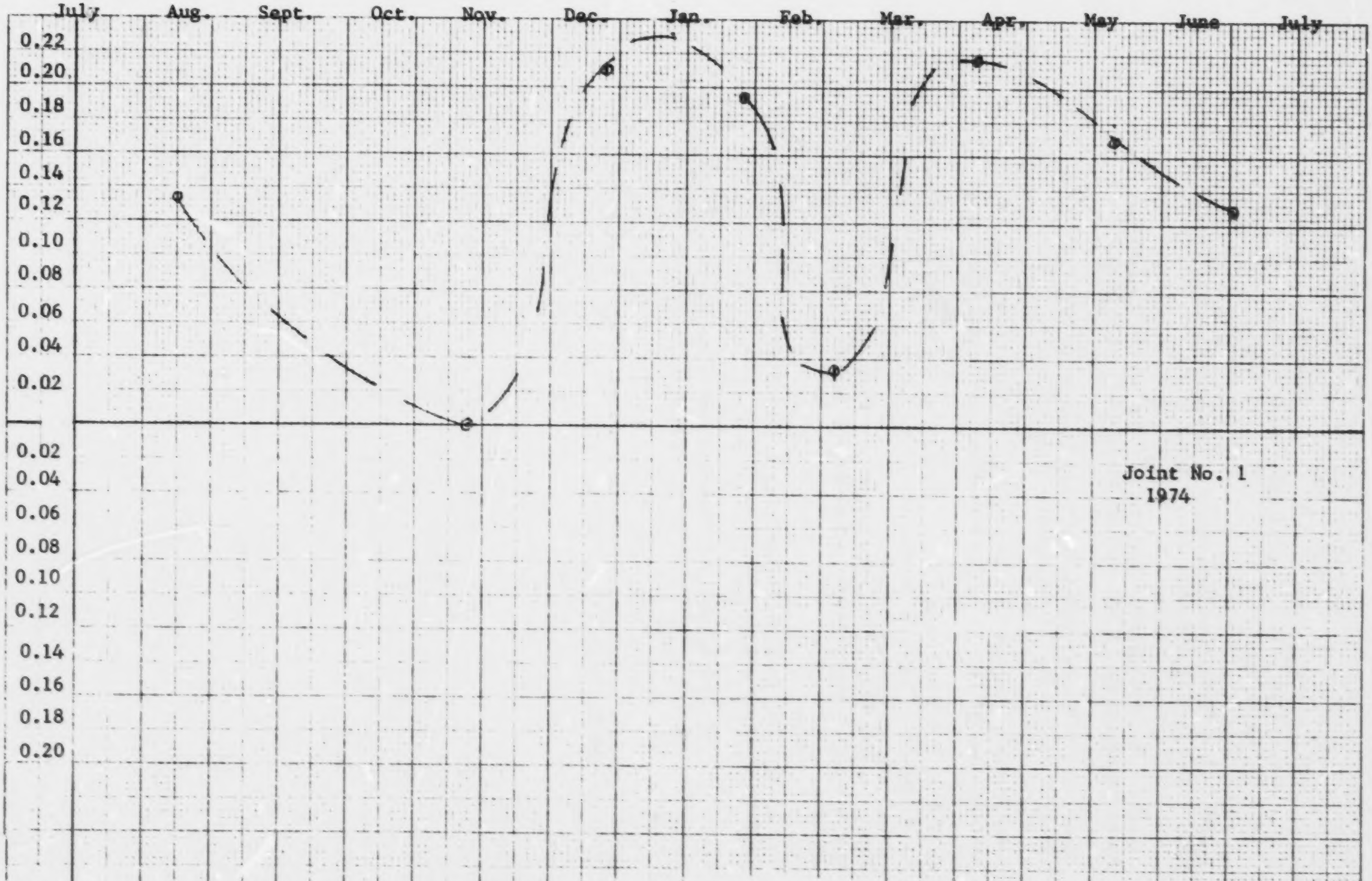

Figure V-1

Horizontal Joint Measurement

K&E 10 X 10 TO 1/2 INCH 7 X 10 INCHES KEUFFEL & ESSER CO MADE IN USA

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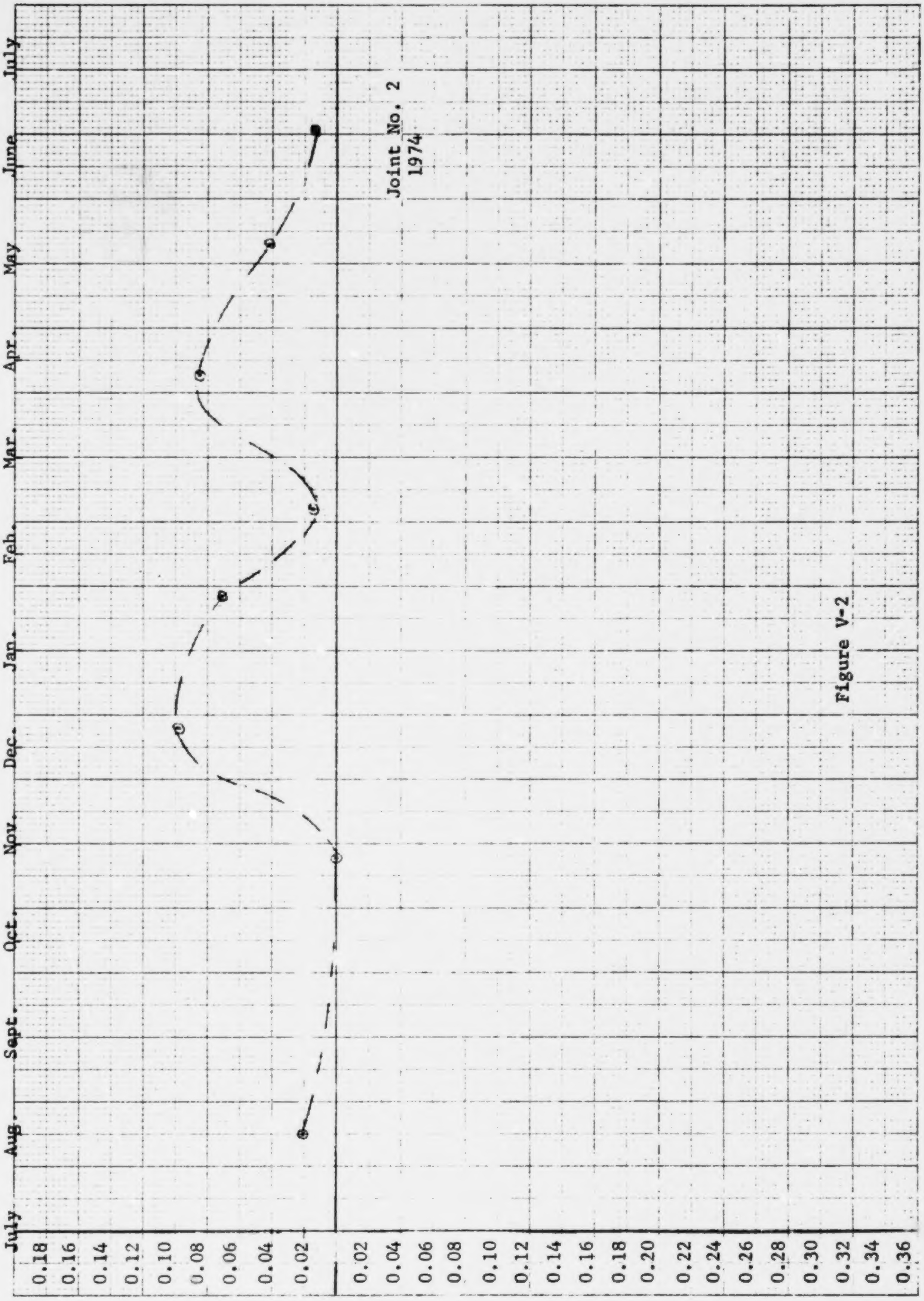

Figure V-2

K·E 10 X 10 TO ½ INCH 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.

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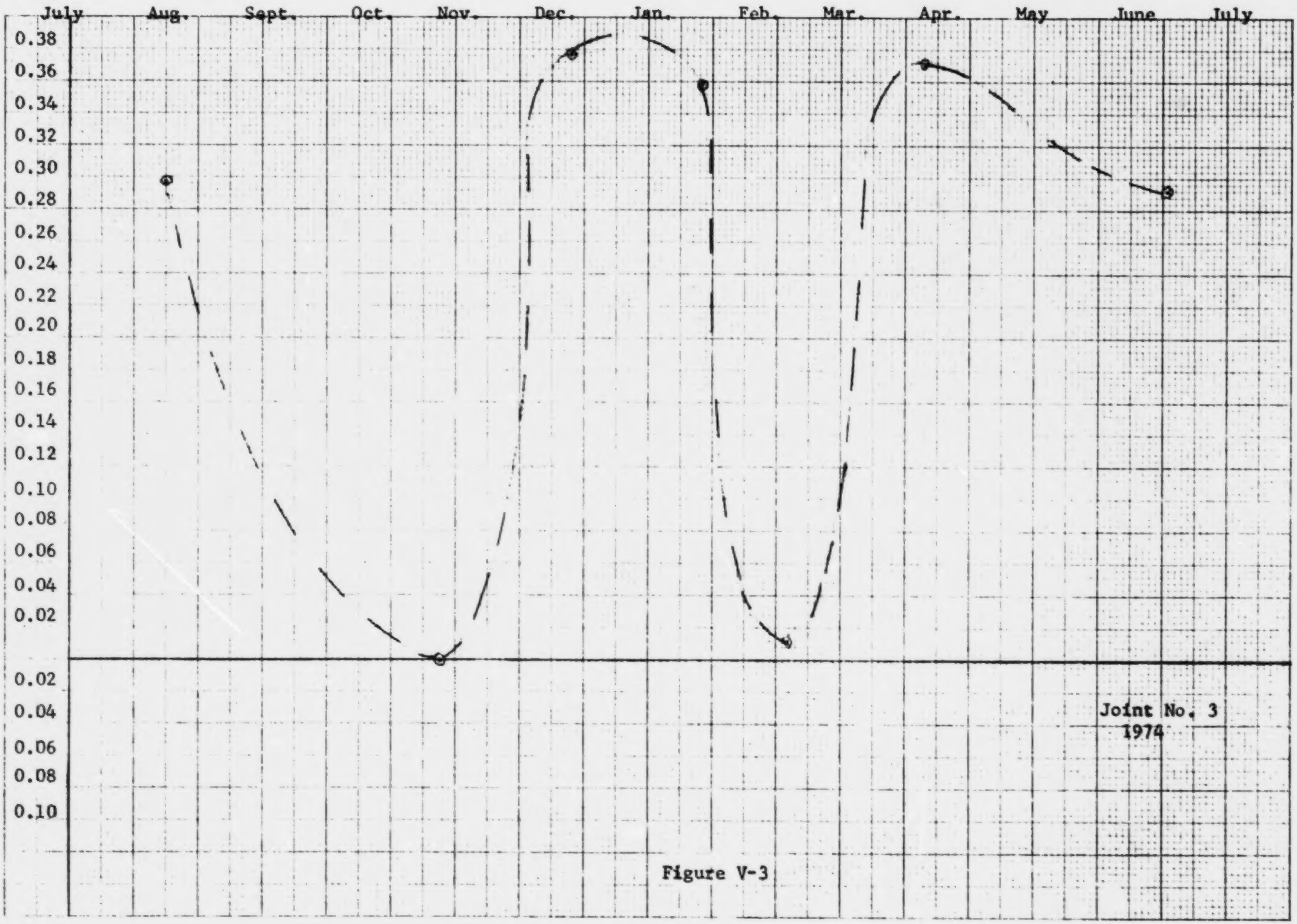

Figure V-3

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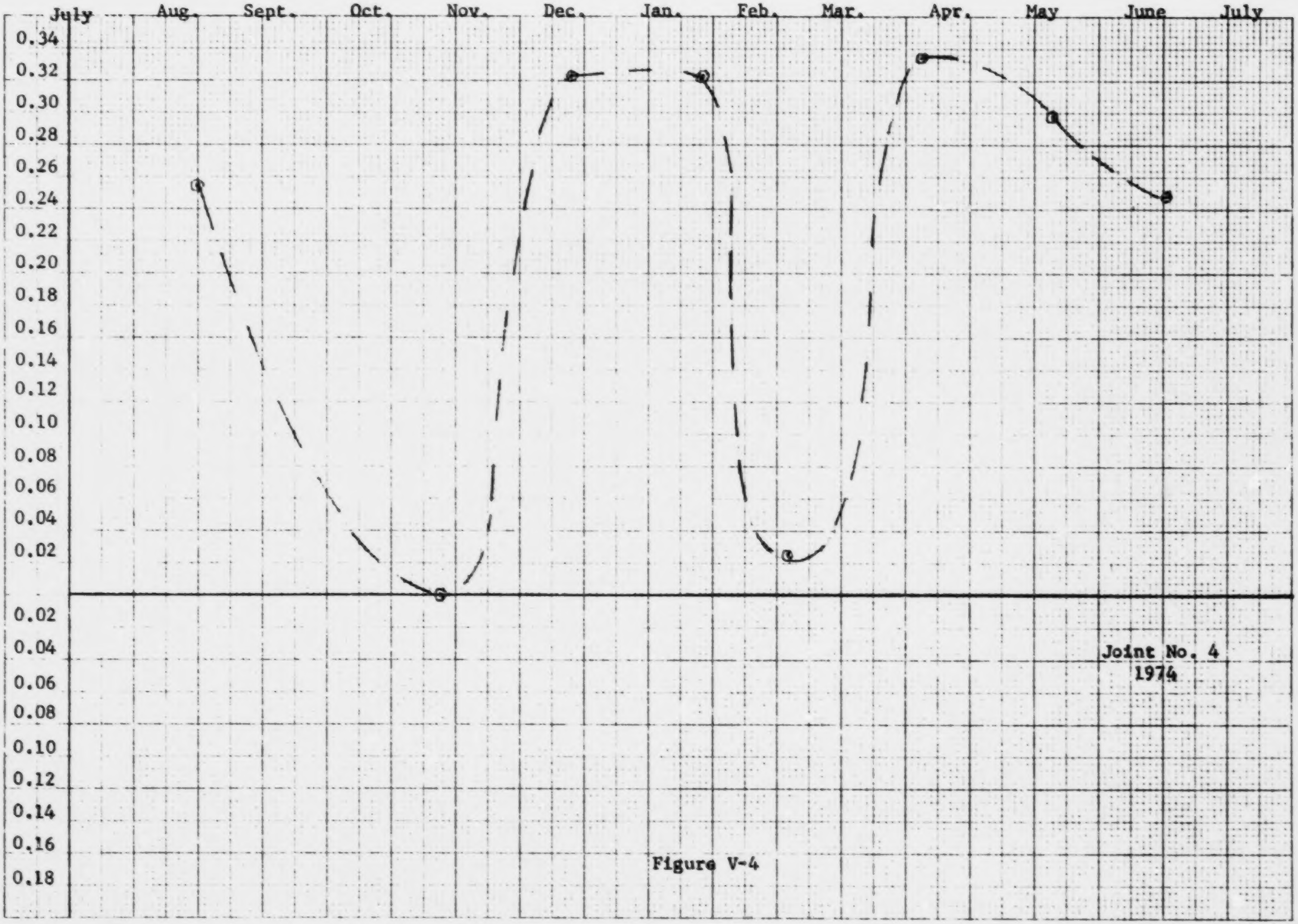
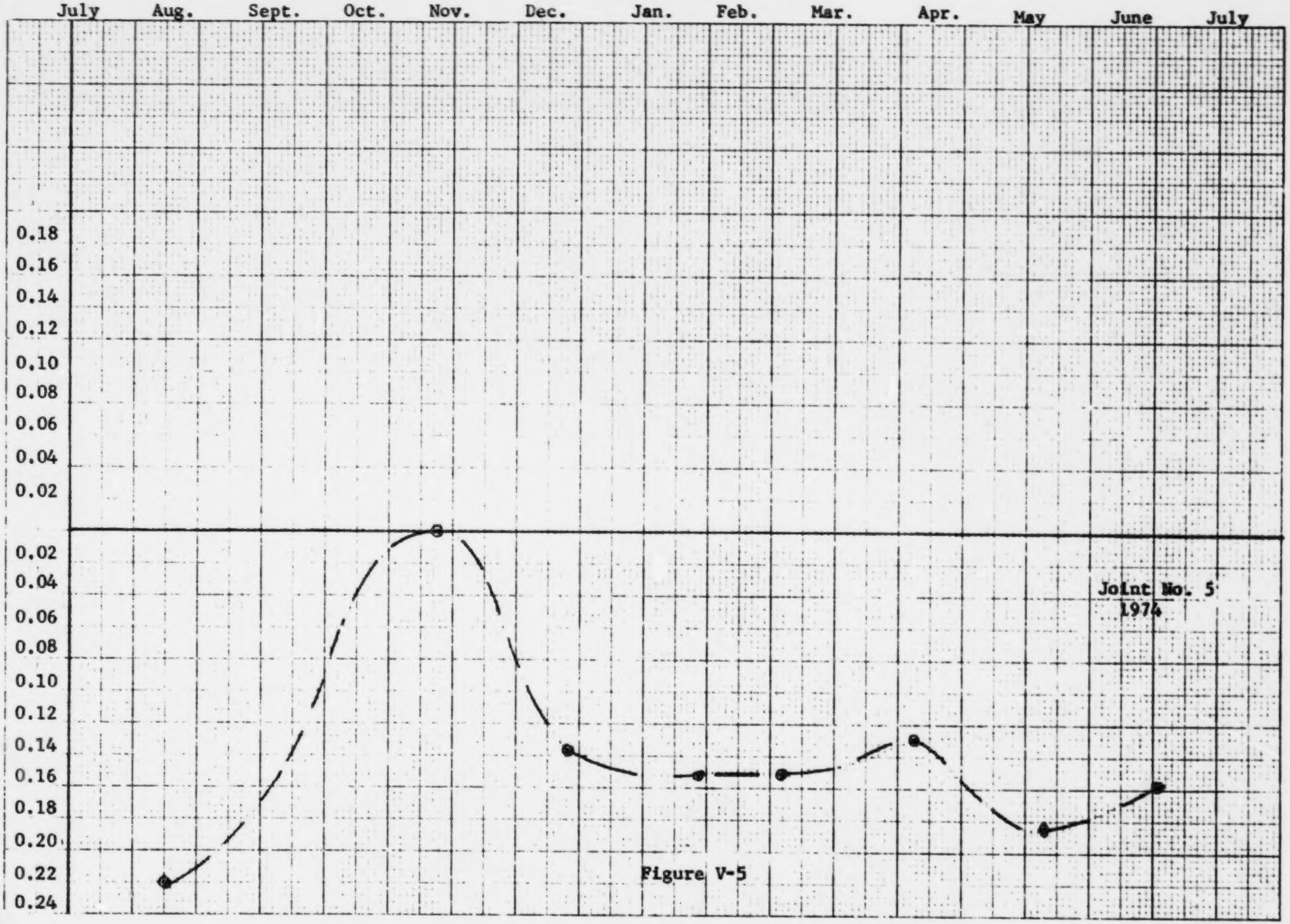


Figure V-4


July
Aug.
Sept.
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June
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0.02
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0.08
0.10
0.12
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0.18
0.20
0.22
0.24
Joint No. 5
1974

Figure V-5

K·E 10 X 10 TO ½ INCH 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 1320

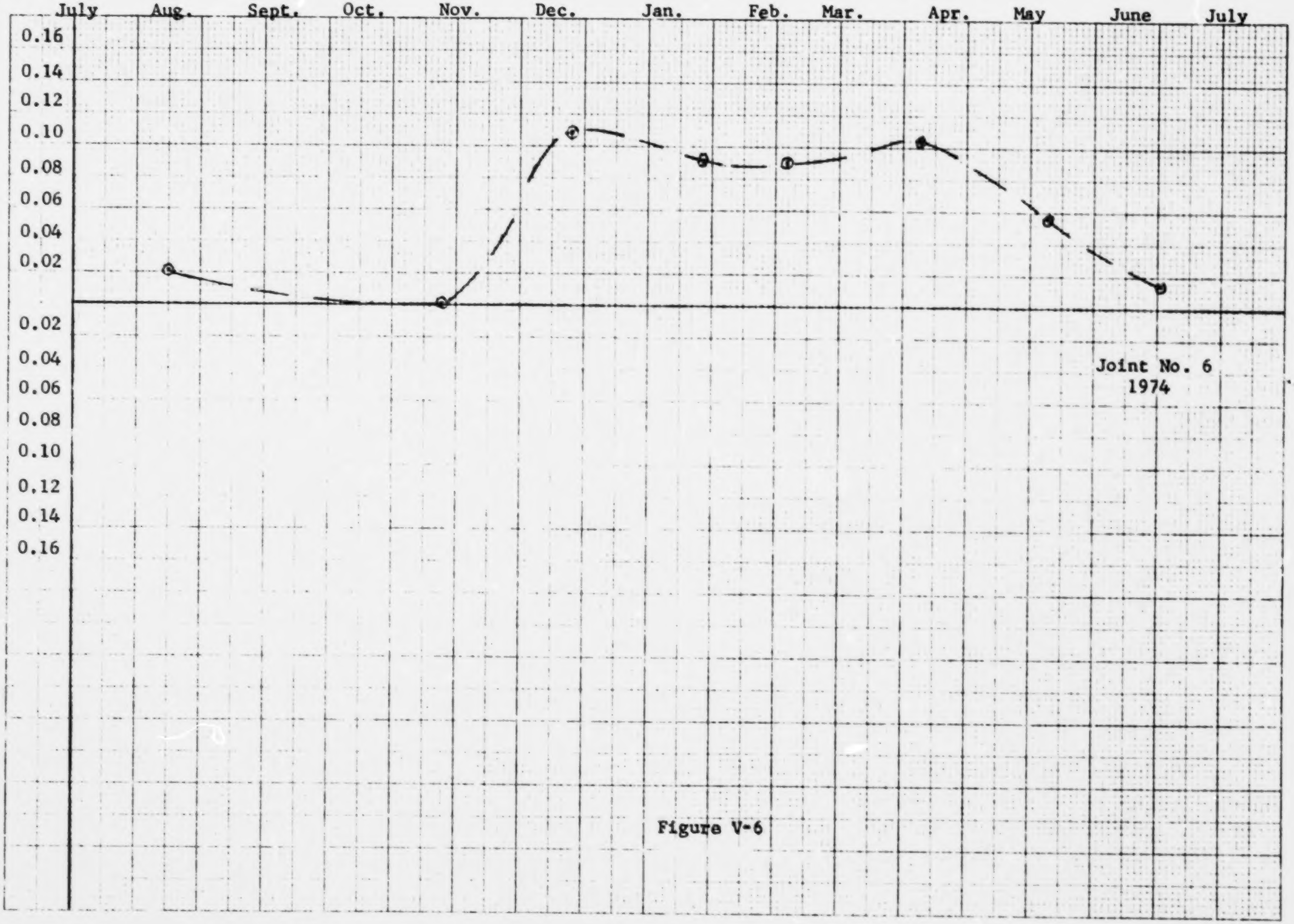

Figure V-6

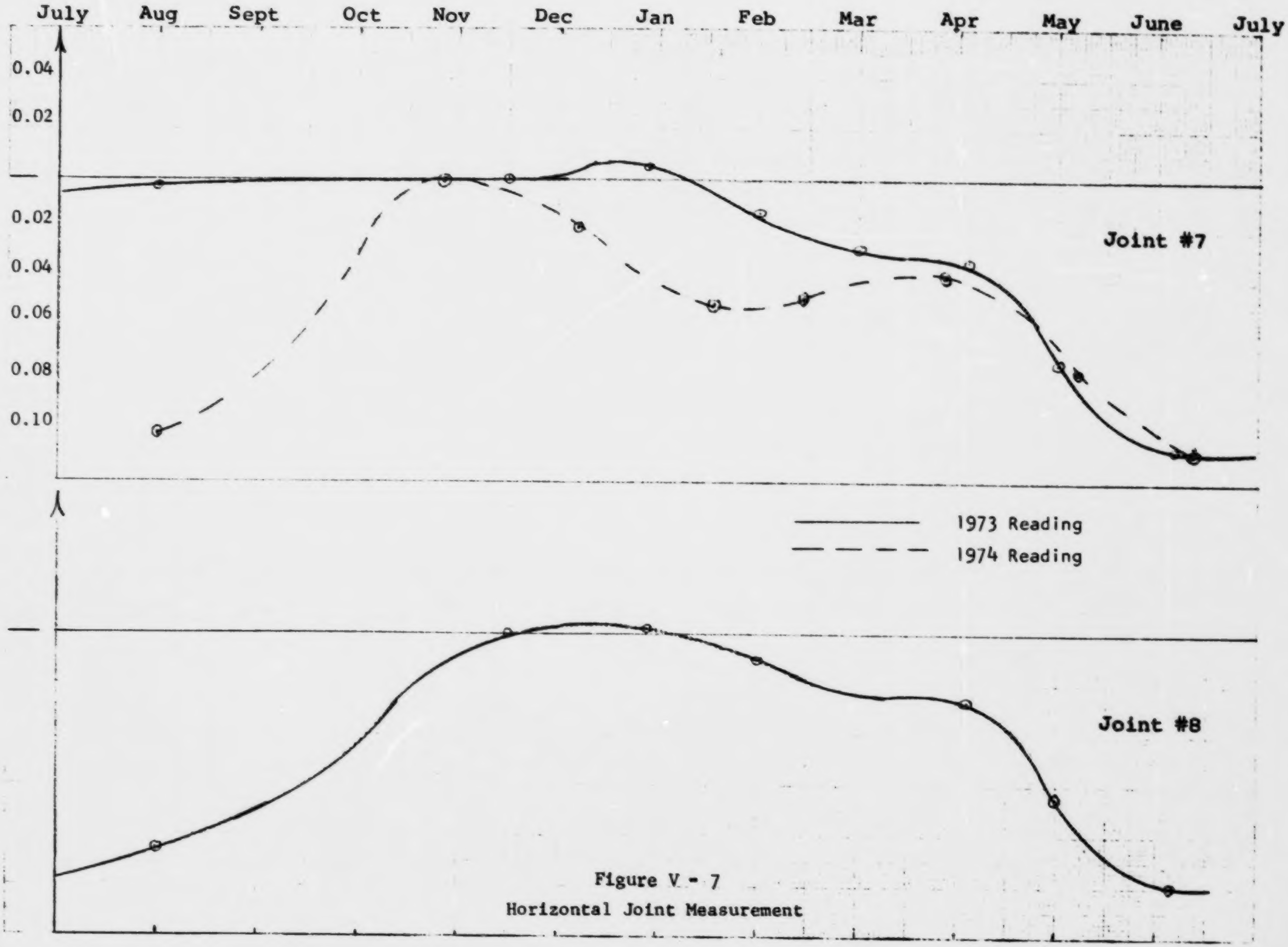

Figure V - 7
Horizontal Joint Measurement

K+E 10 X 10 TO ½ INCH 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN USA

46 1320

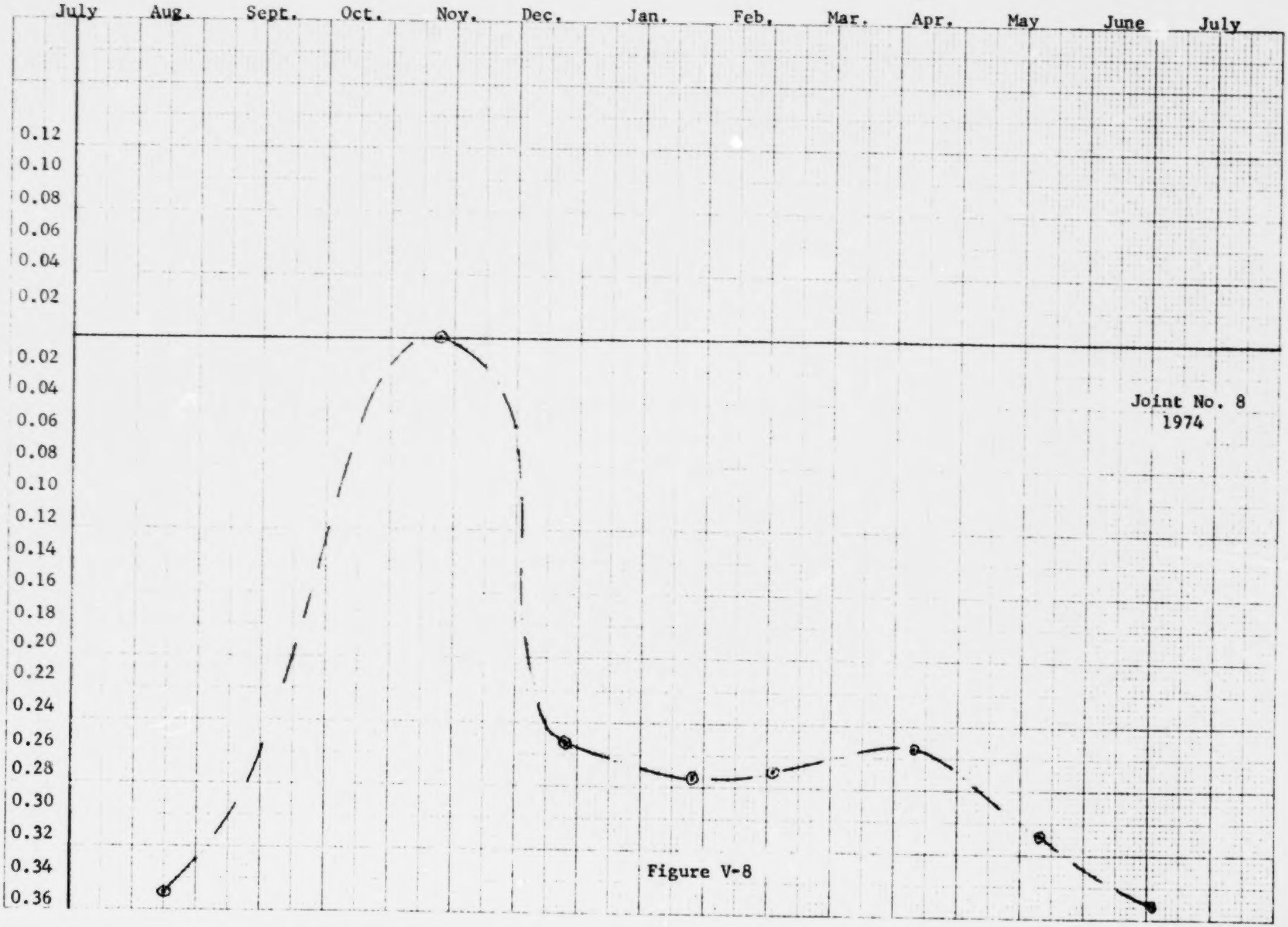

Figure V-8

K-E 10 X 10 TO ½ INCH 7 X 10 INCHES
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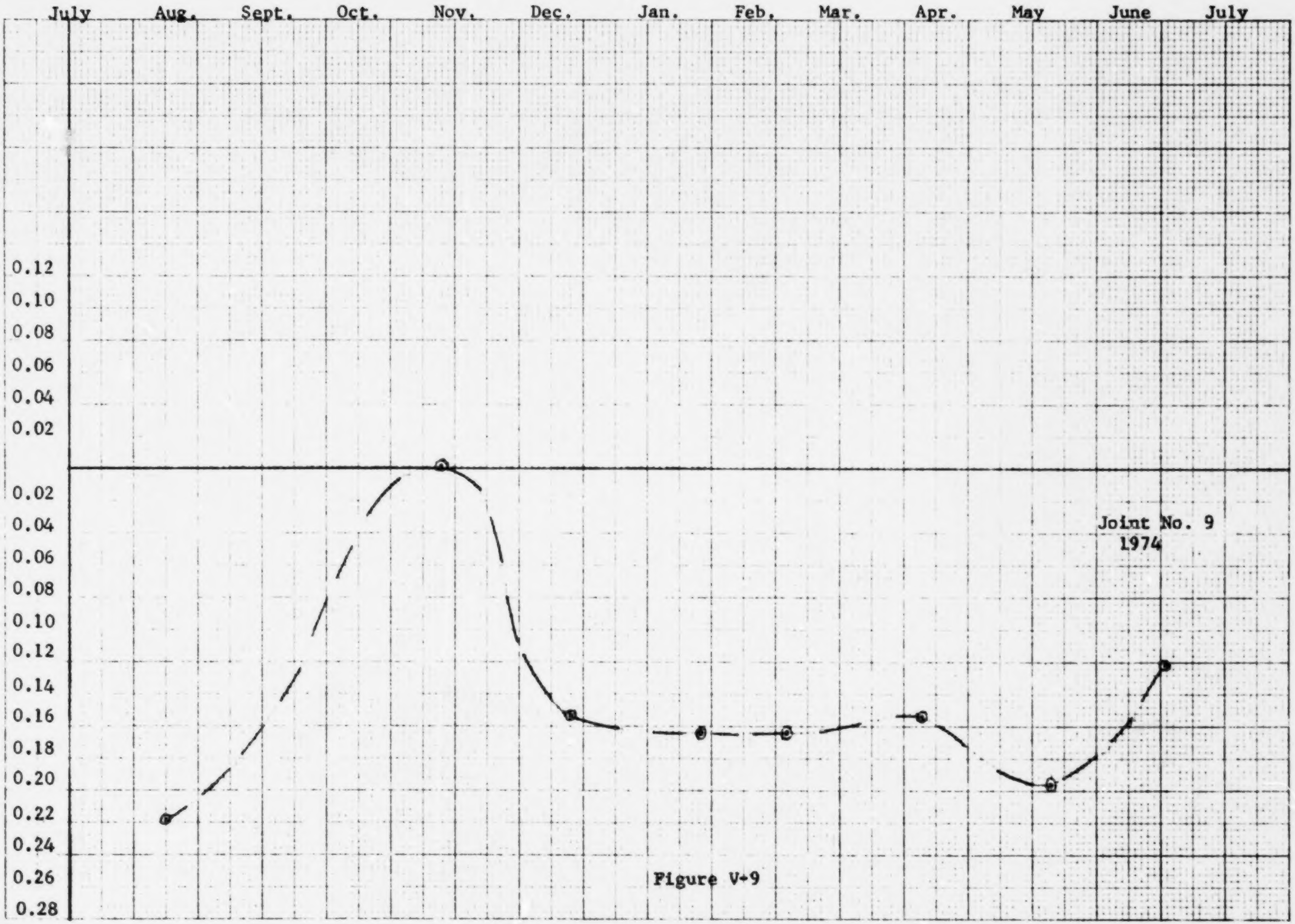

Figure V-9

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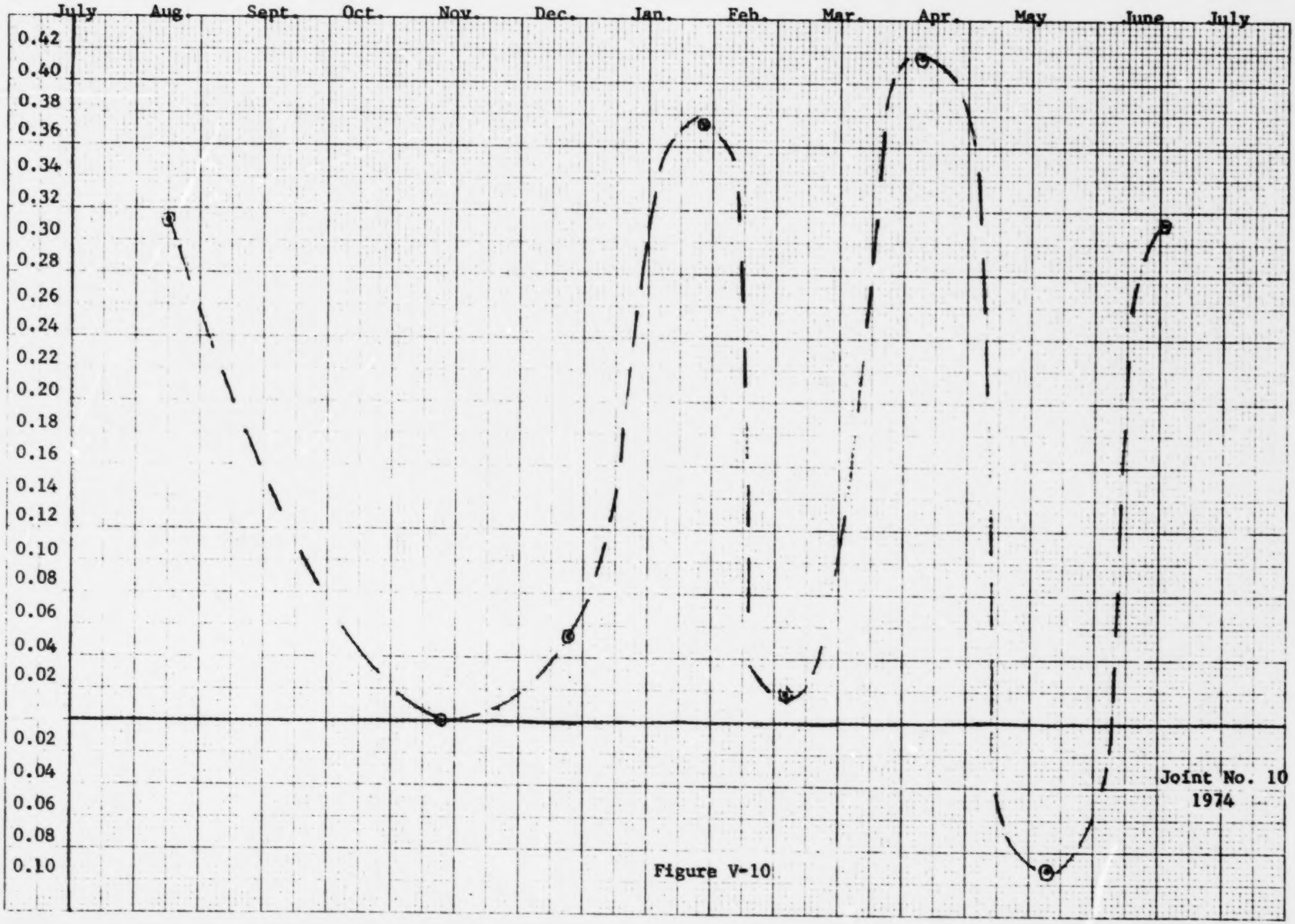

Joint No. 10
1974

Figure V-10

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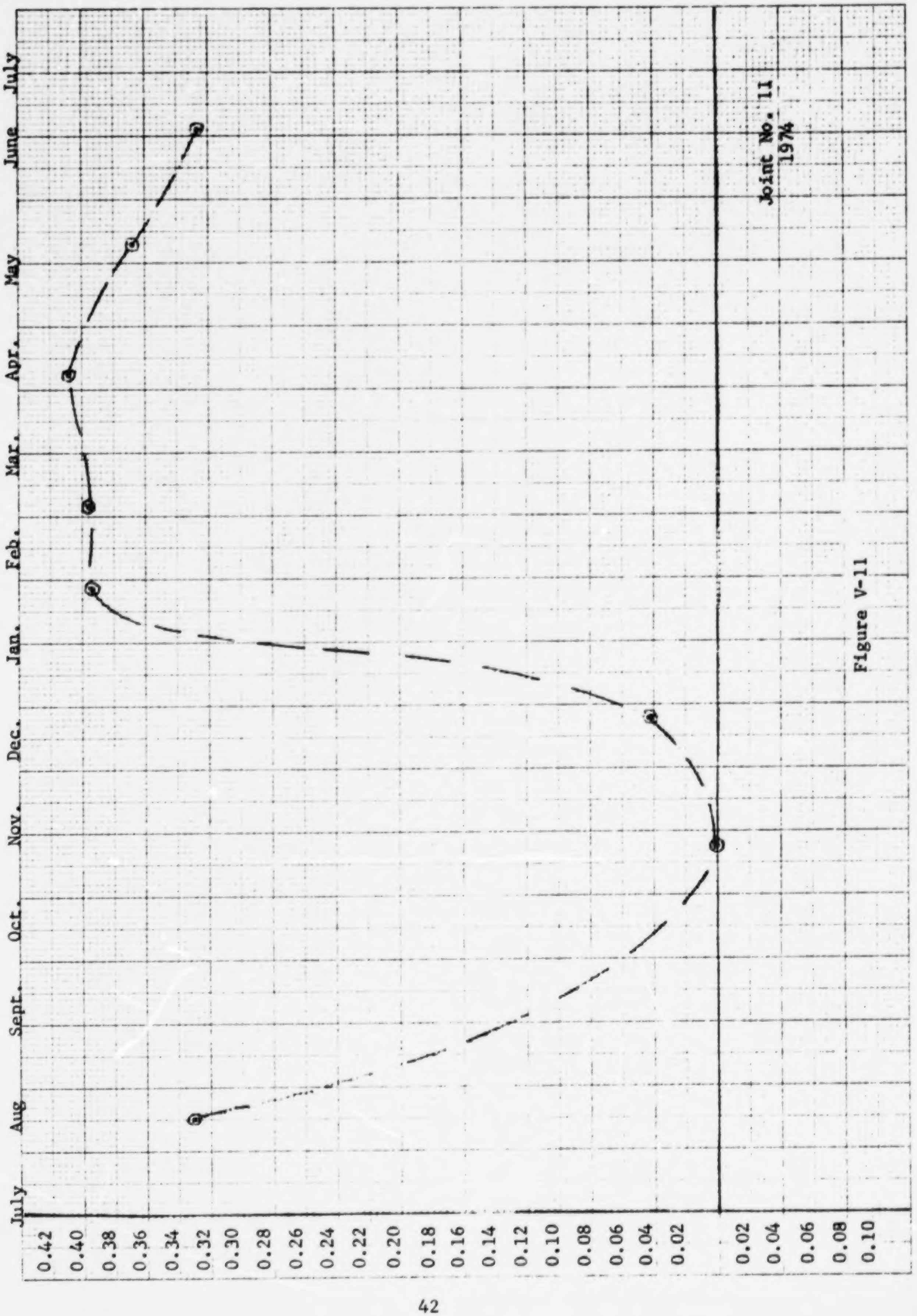


Figure V-11

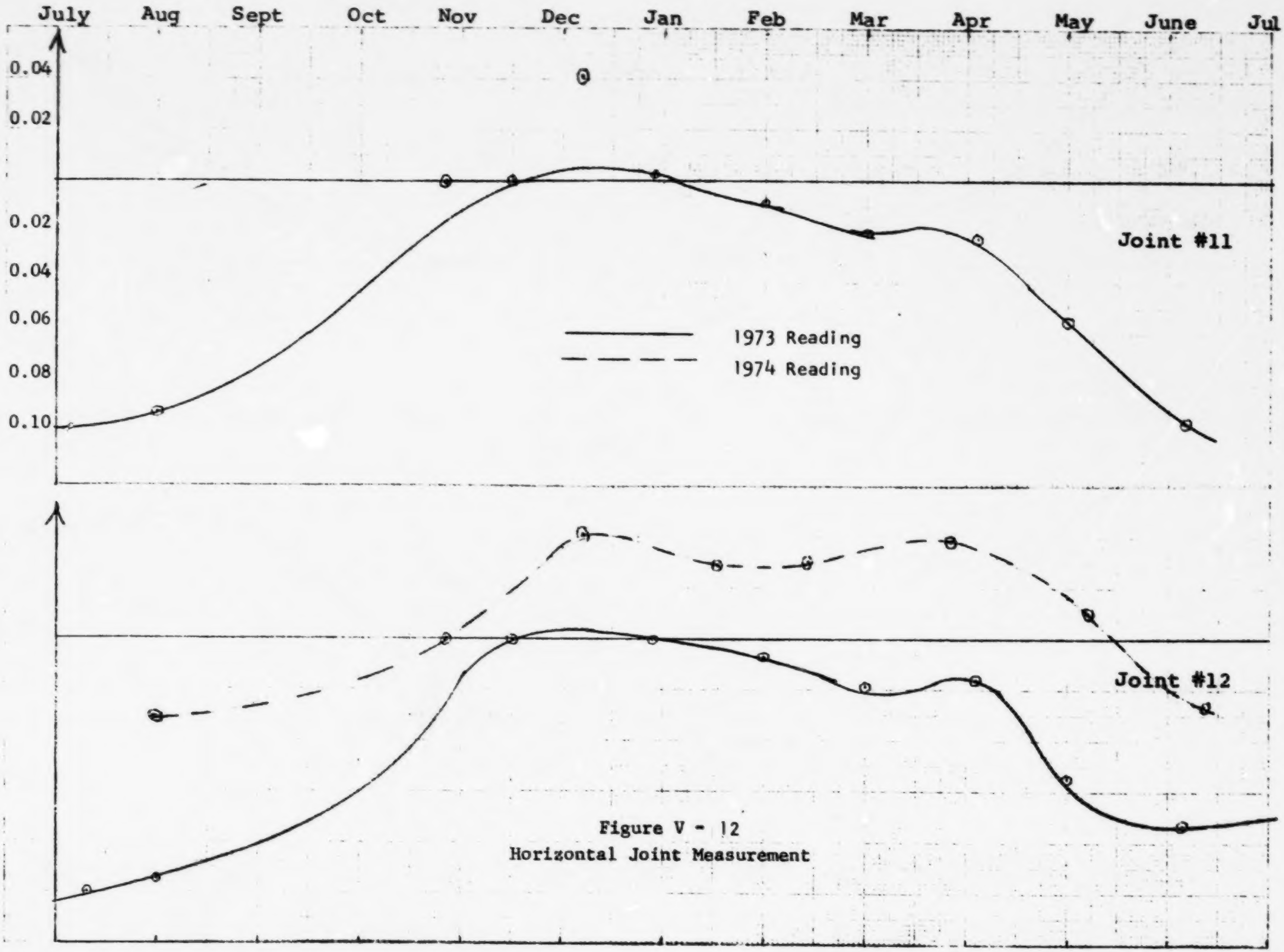


Figure V - 12
Horizontal Joint Measurement

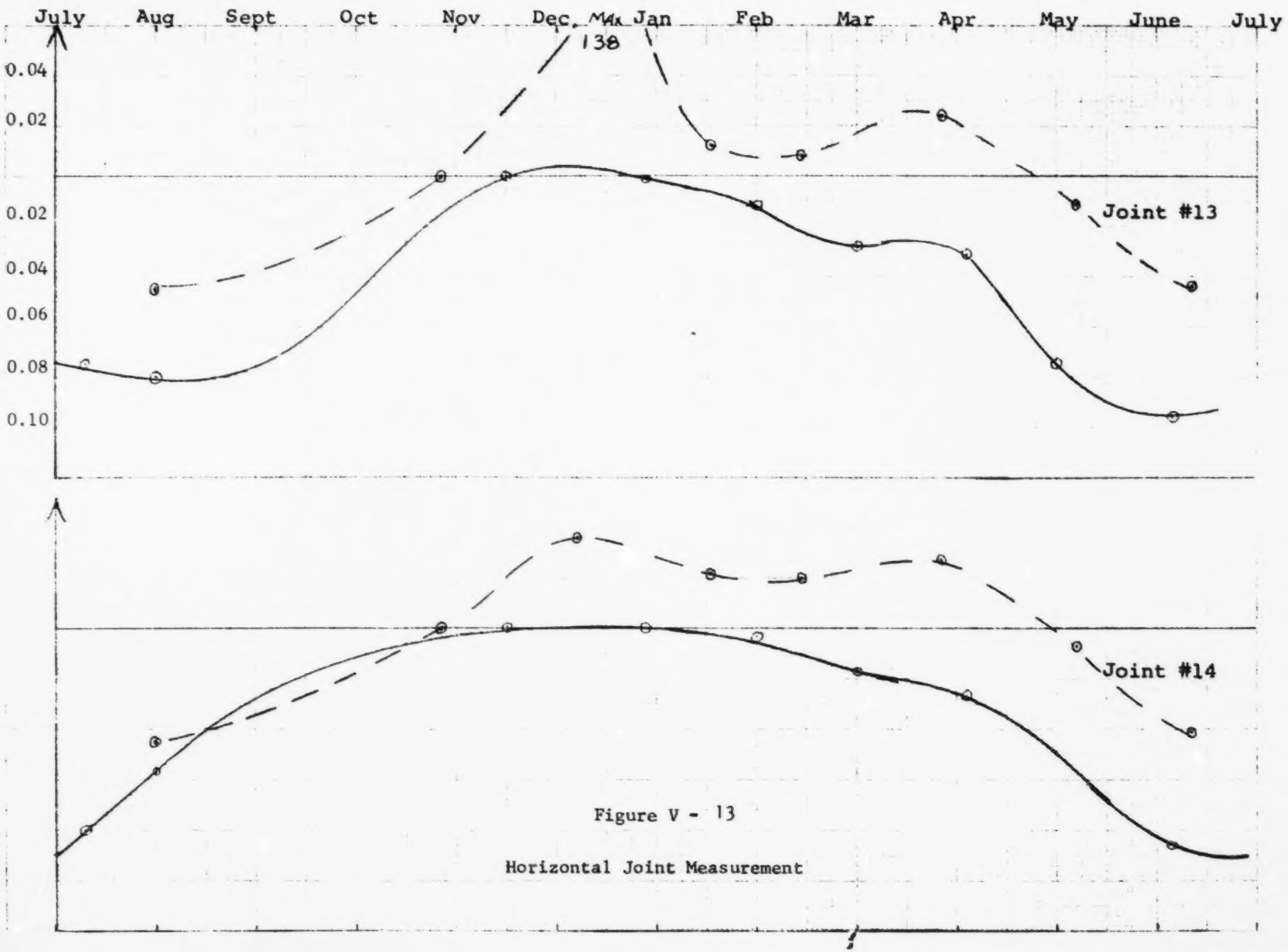


Figure V - 13

Horizontal Joint Measurement

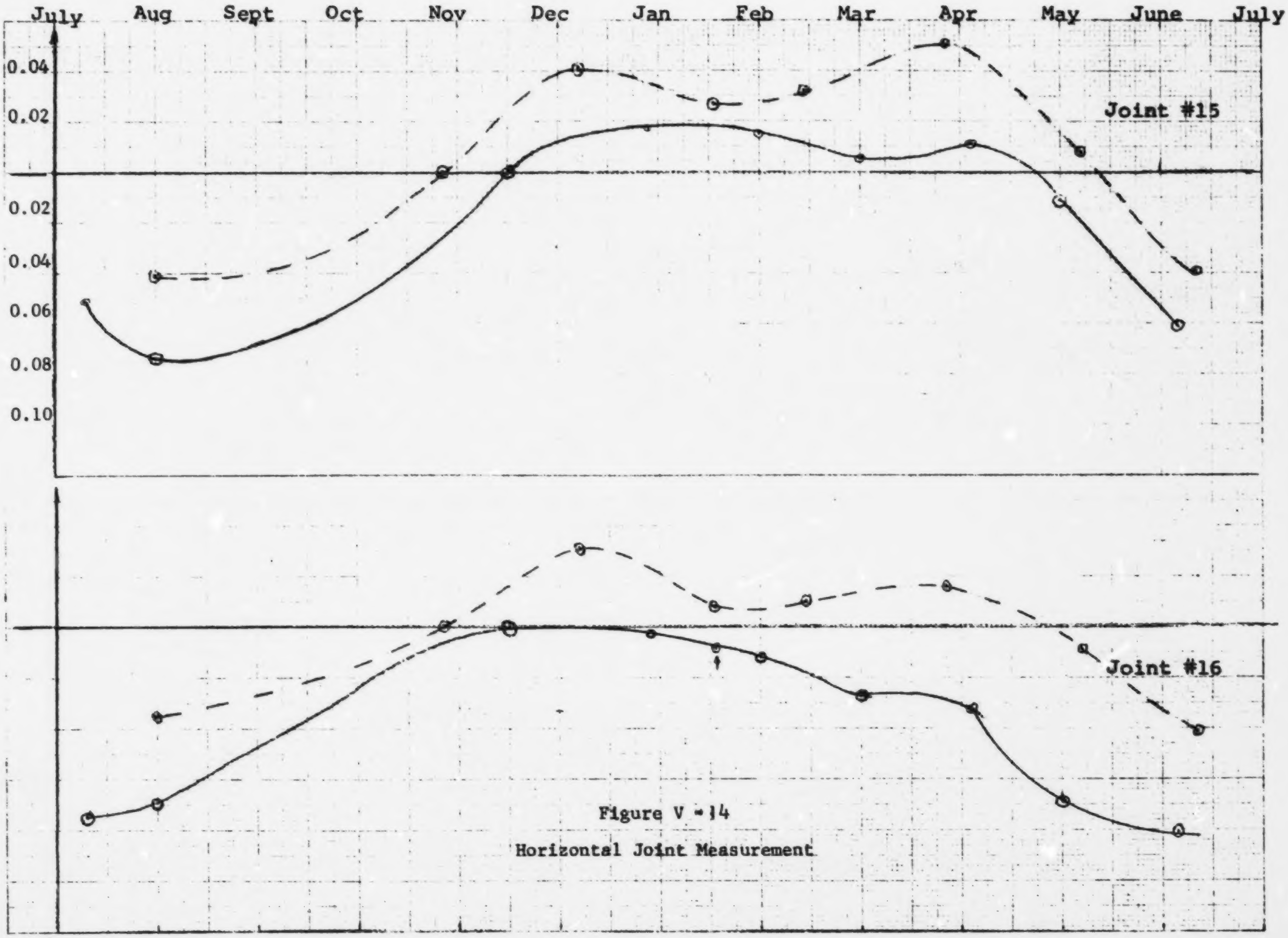


Figure V - 14

Horizontal Joint Measurement

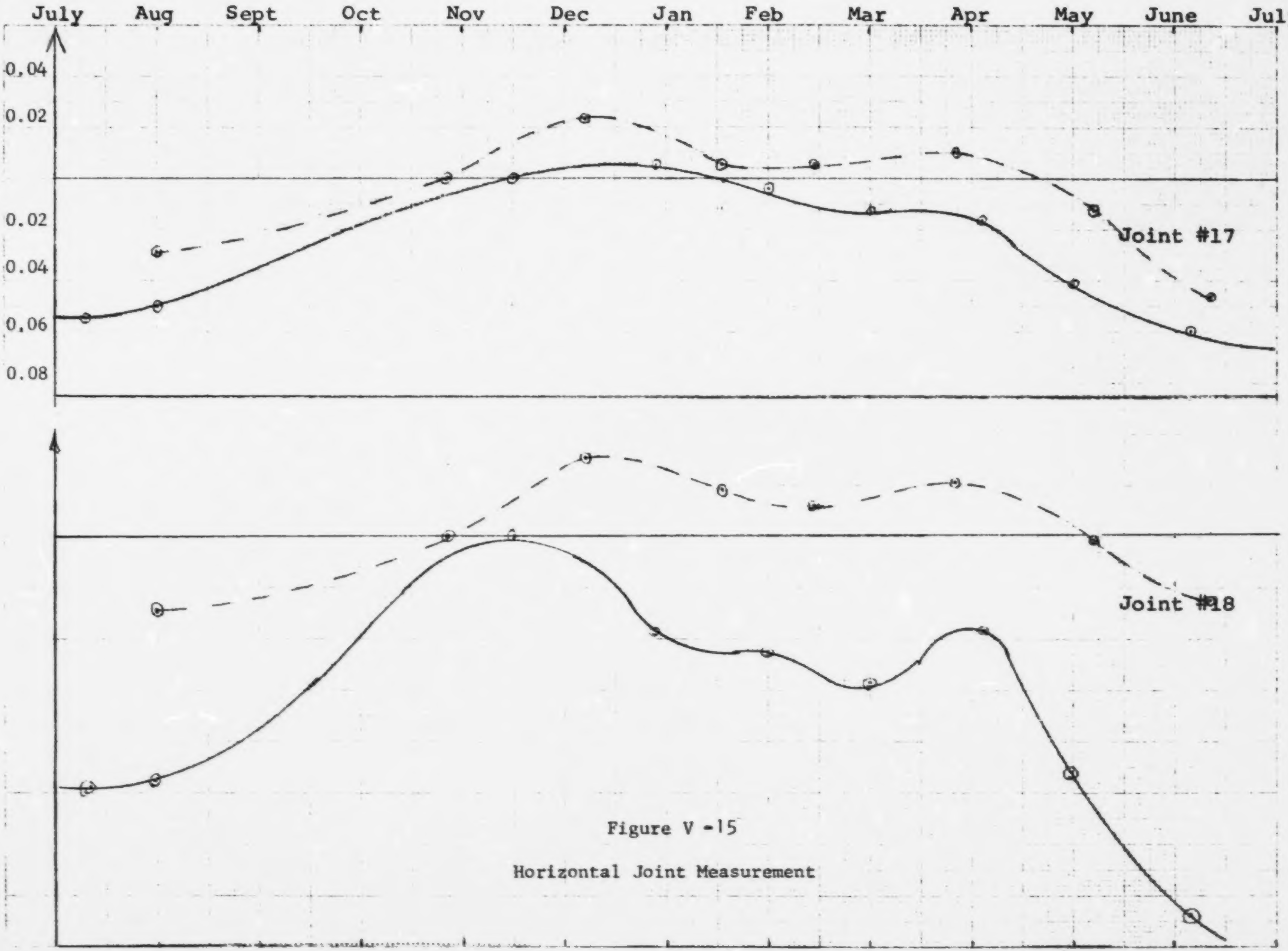


Figure V -15

Horizontal Joint Measurement

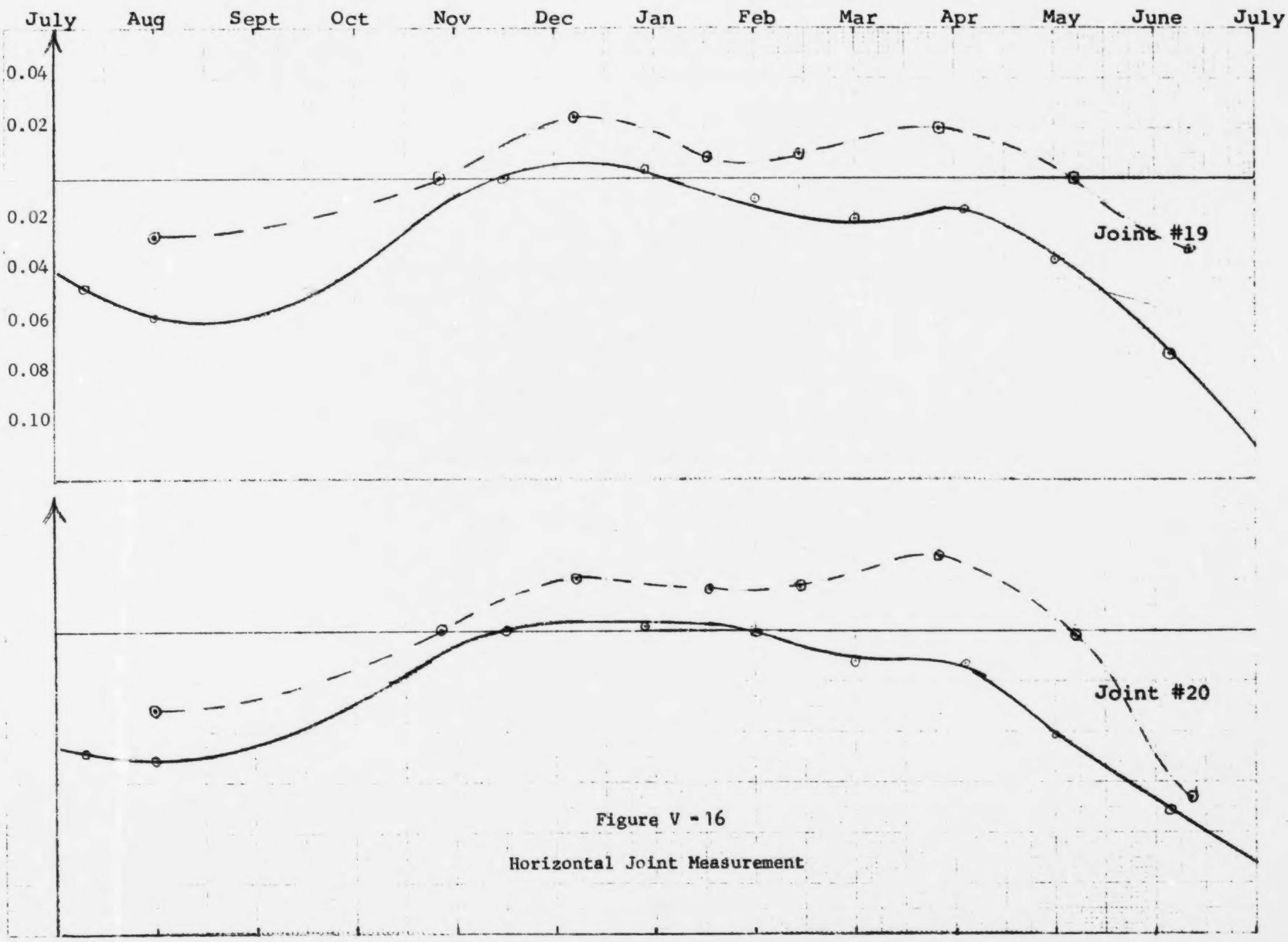


Figure V - 16

Horizontal Joint Measurement

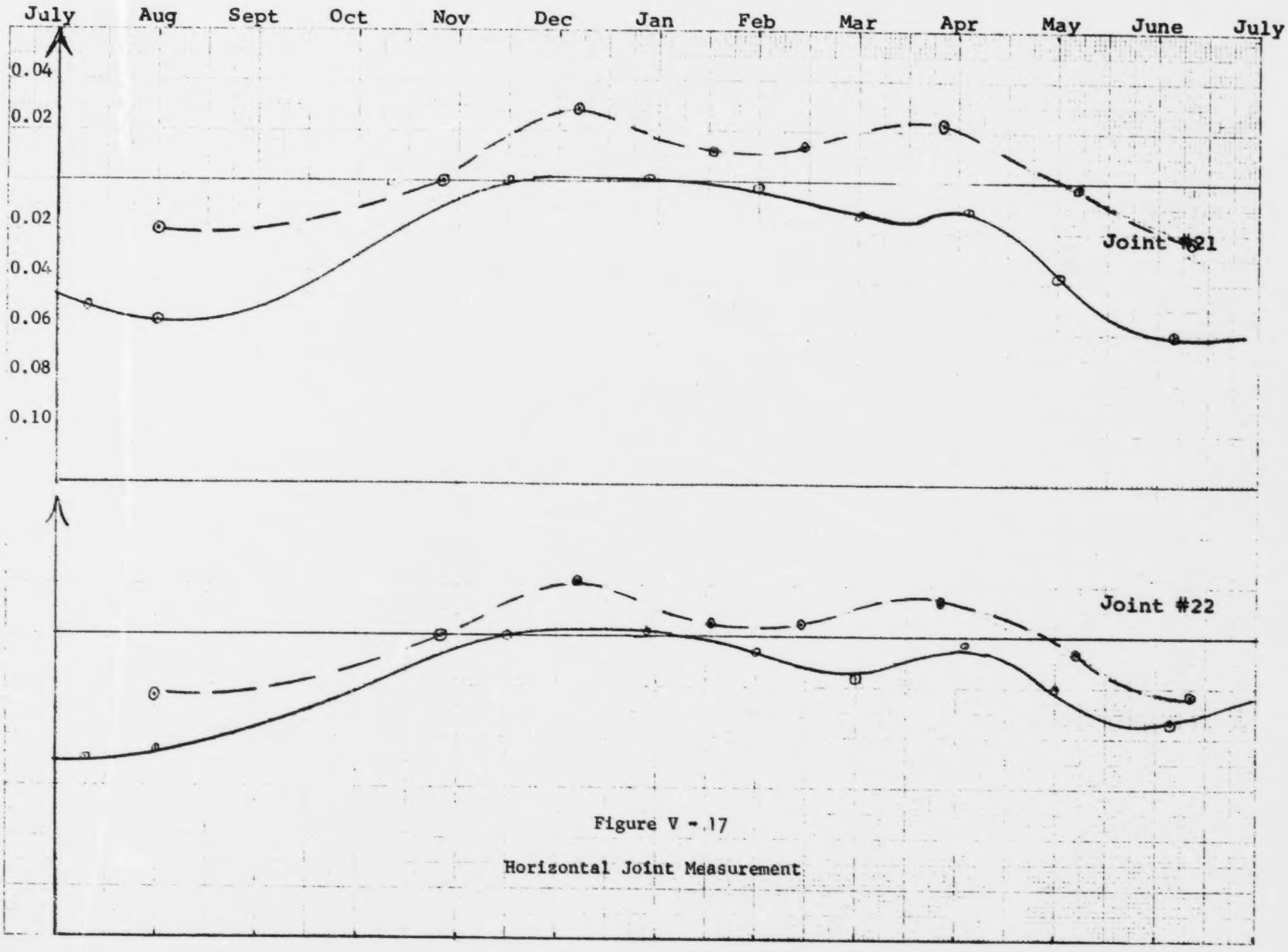


Figure V - 17

Horizontal Joint Measurement

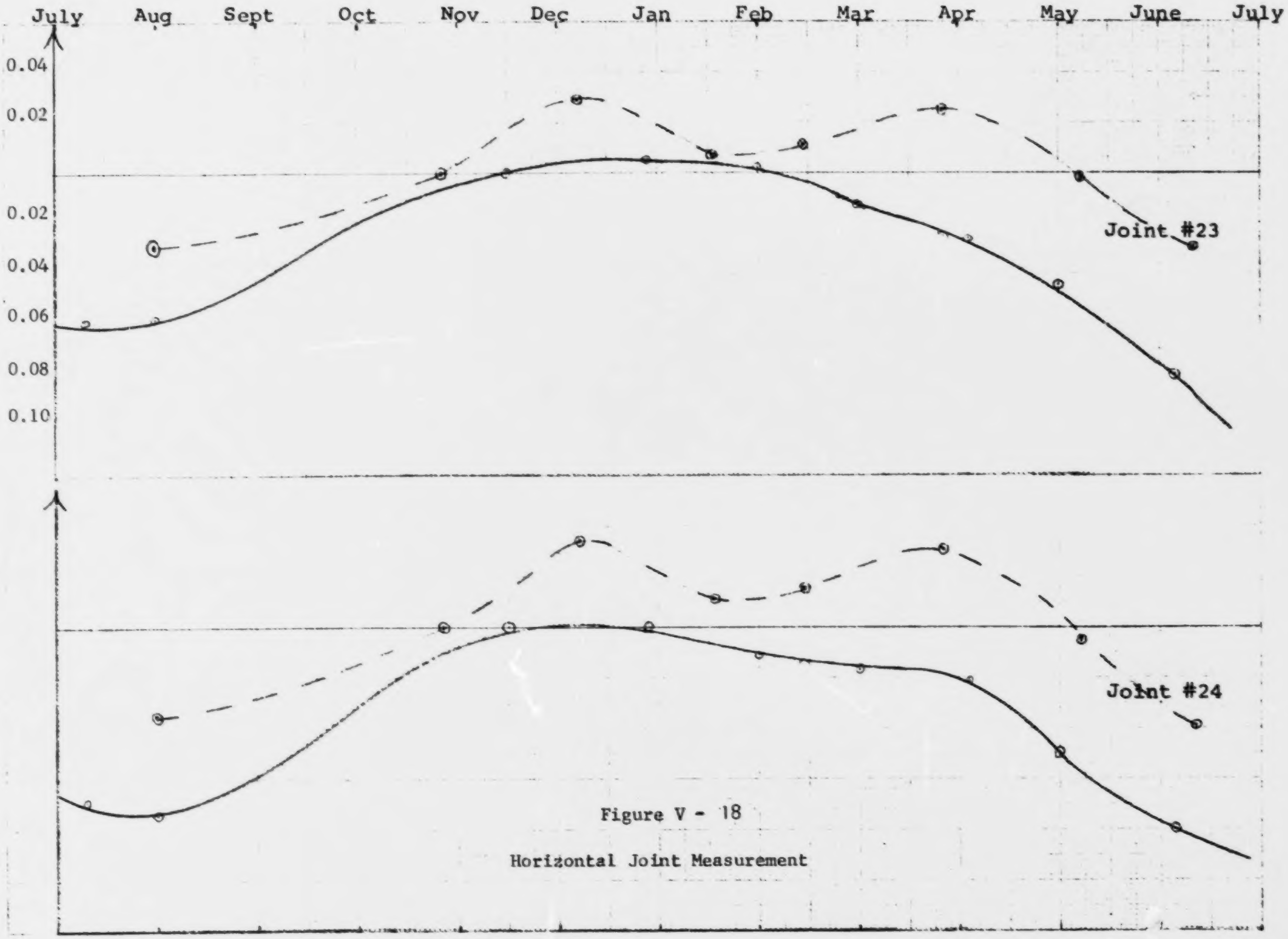


Figure V - 18

Horizontal Joint Measurement

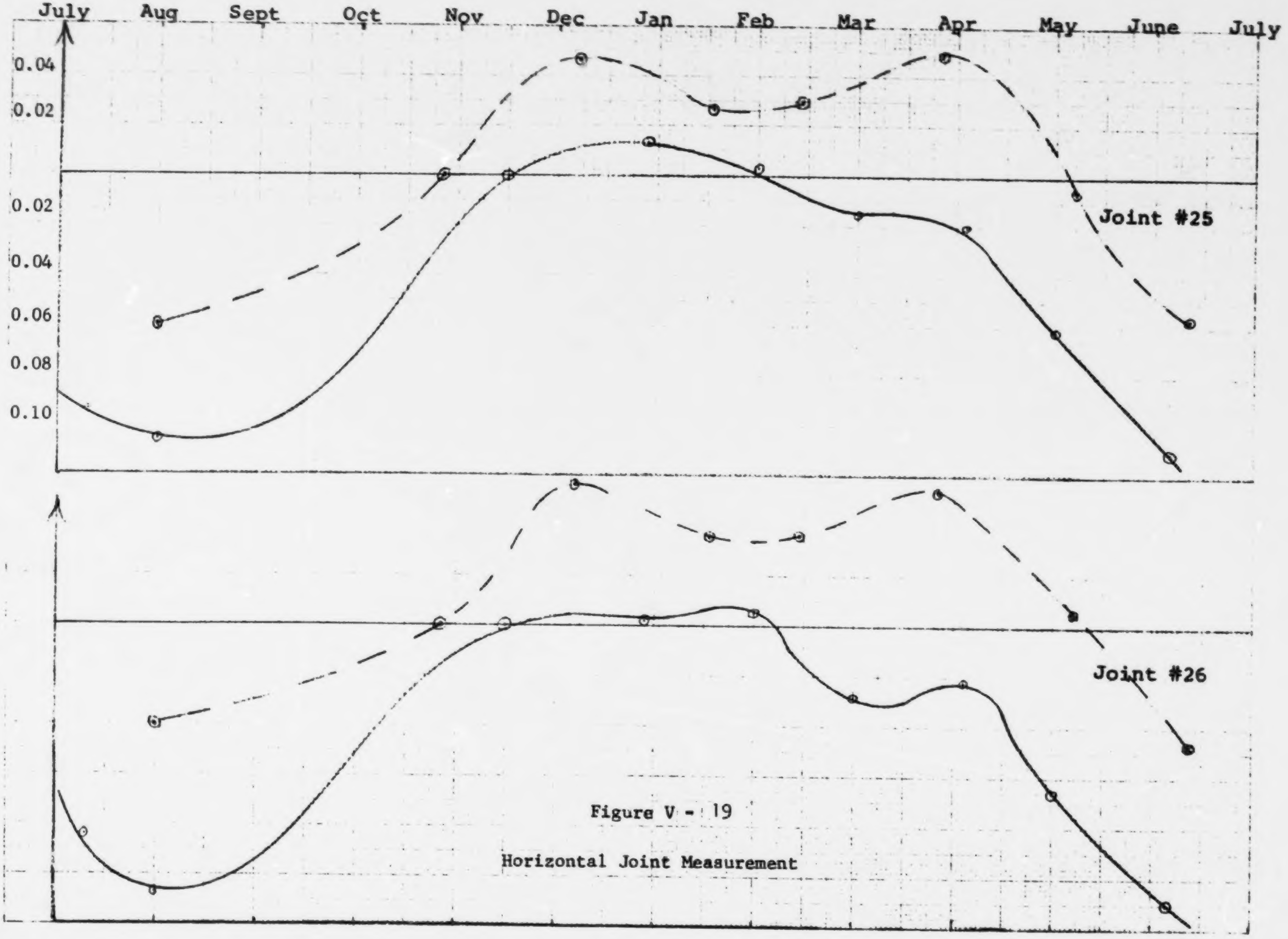


Figure V - 19

Horizontal Joint Measurement

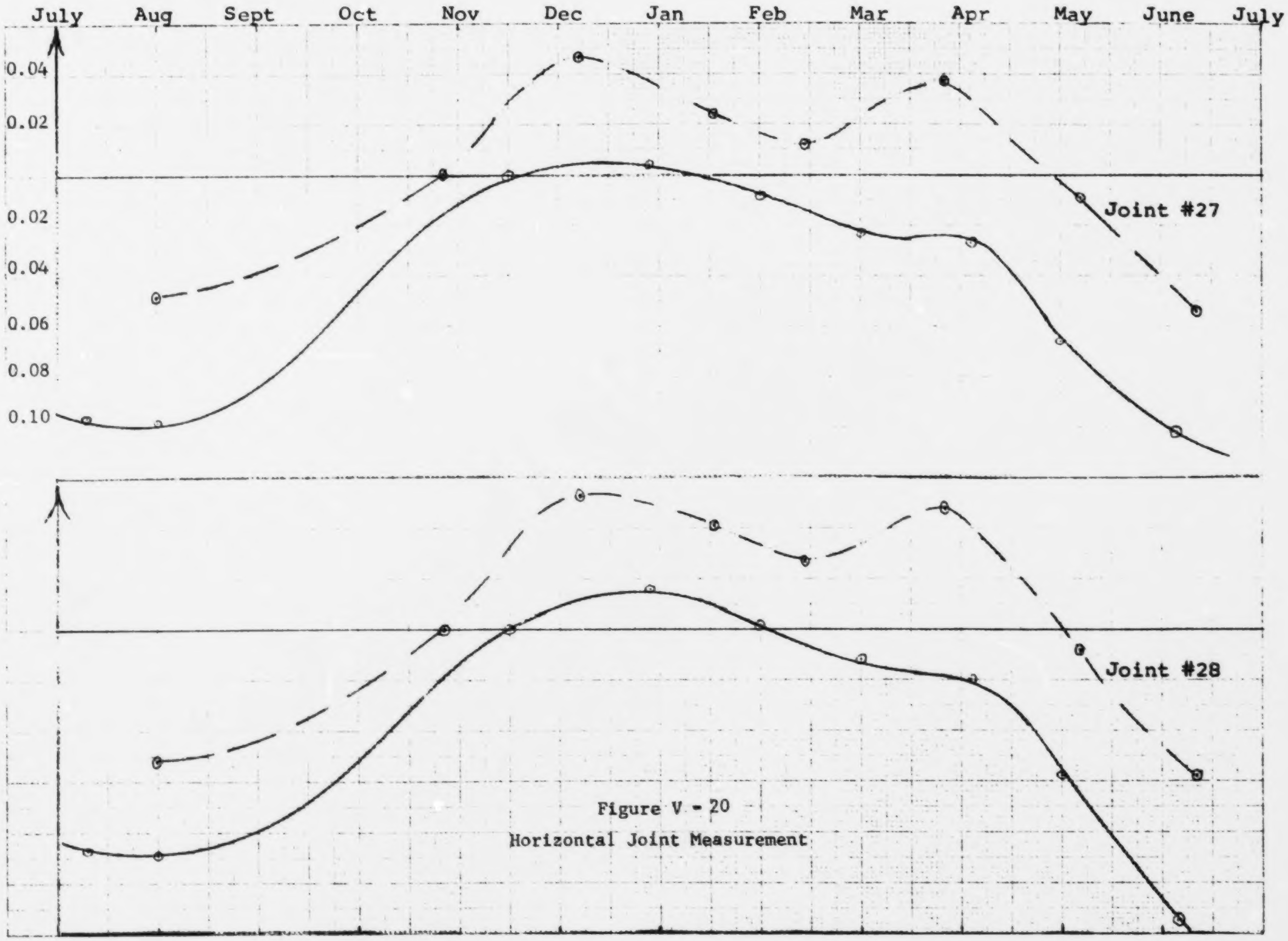


Figure V - 20

Horizontal Joint Measurement

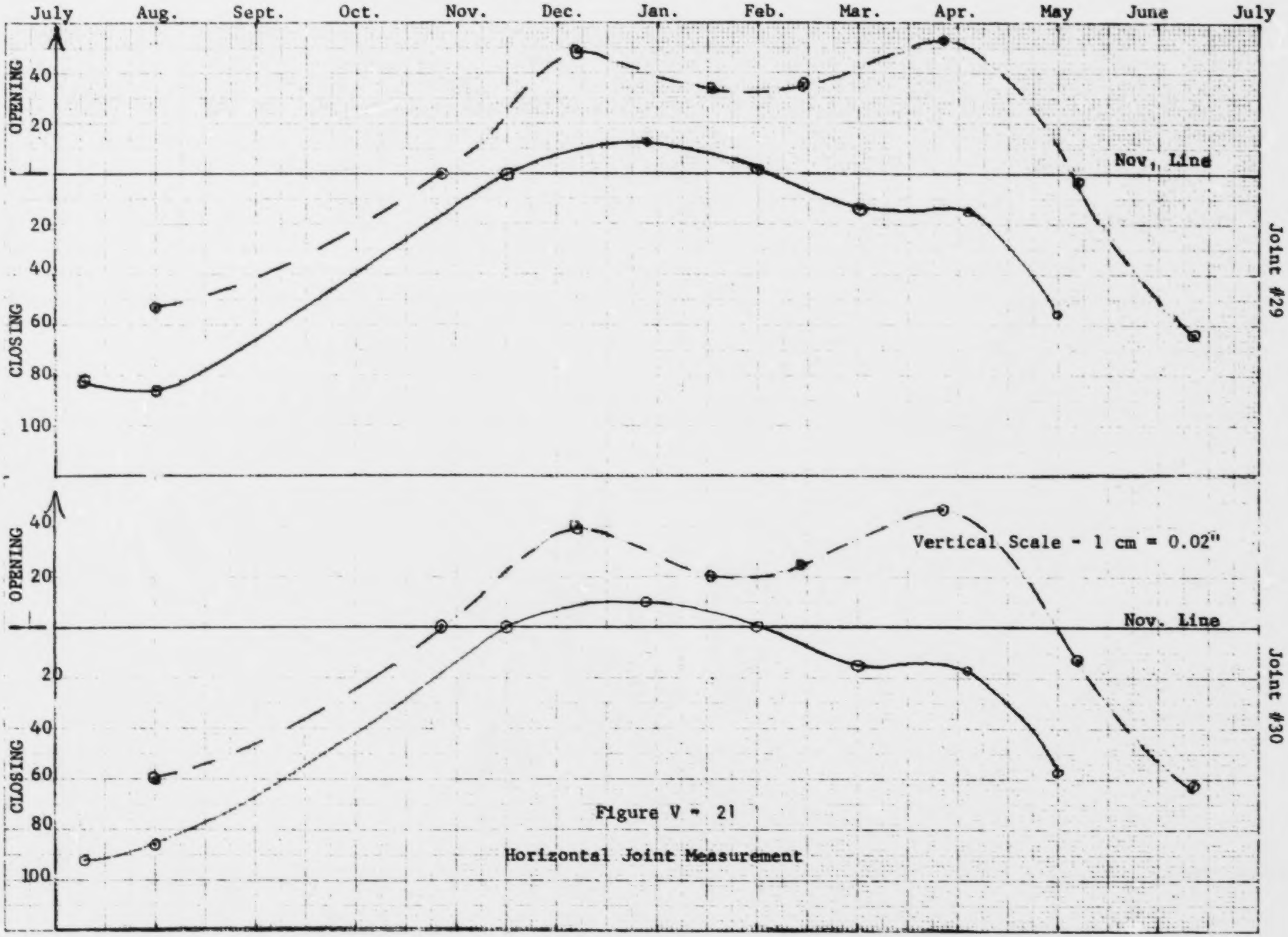


Figure V - 21

Horizontal Joint Measurement

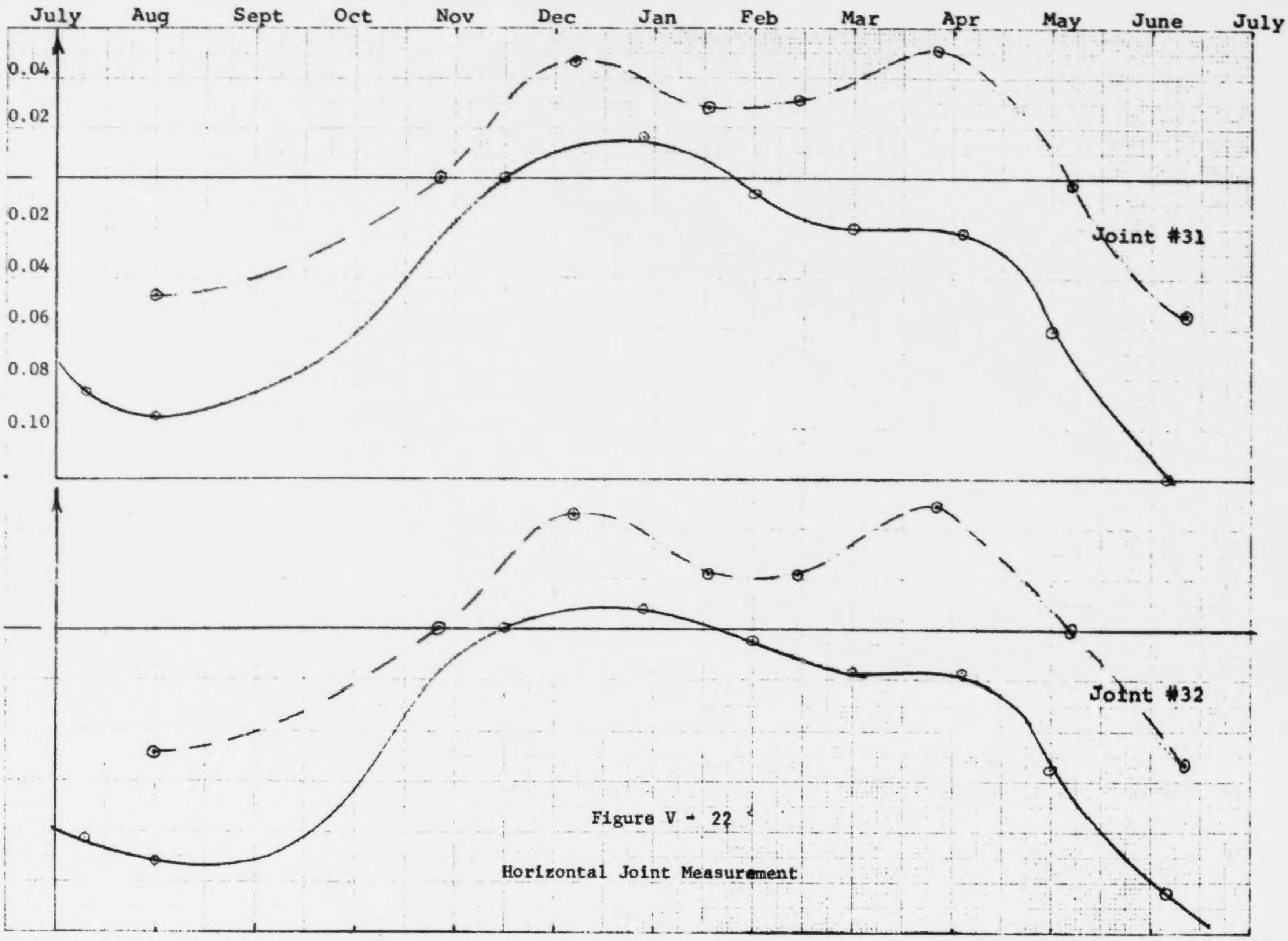


Figure V - 22

Horizontal Joint Measurement

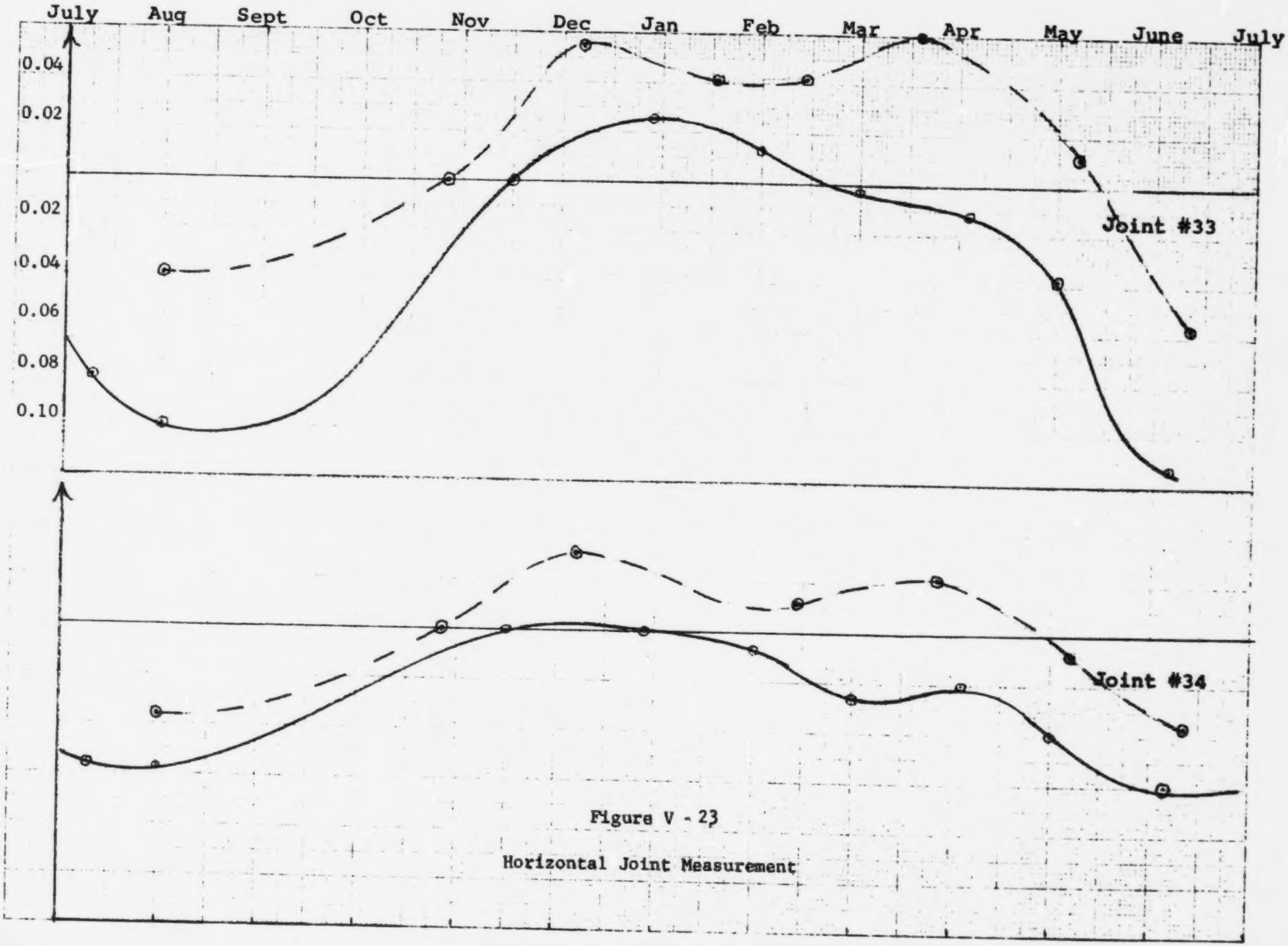


Figure V - 23

Horizontal Joint Measurement

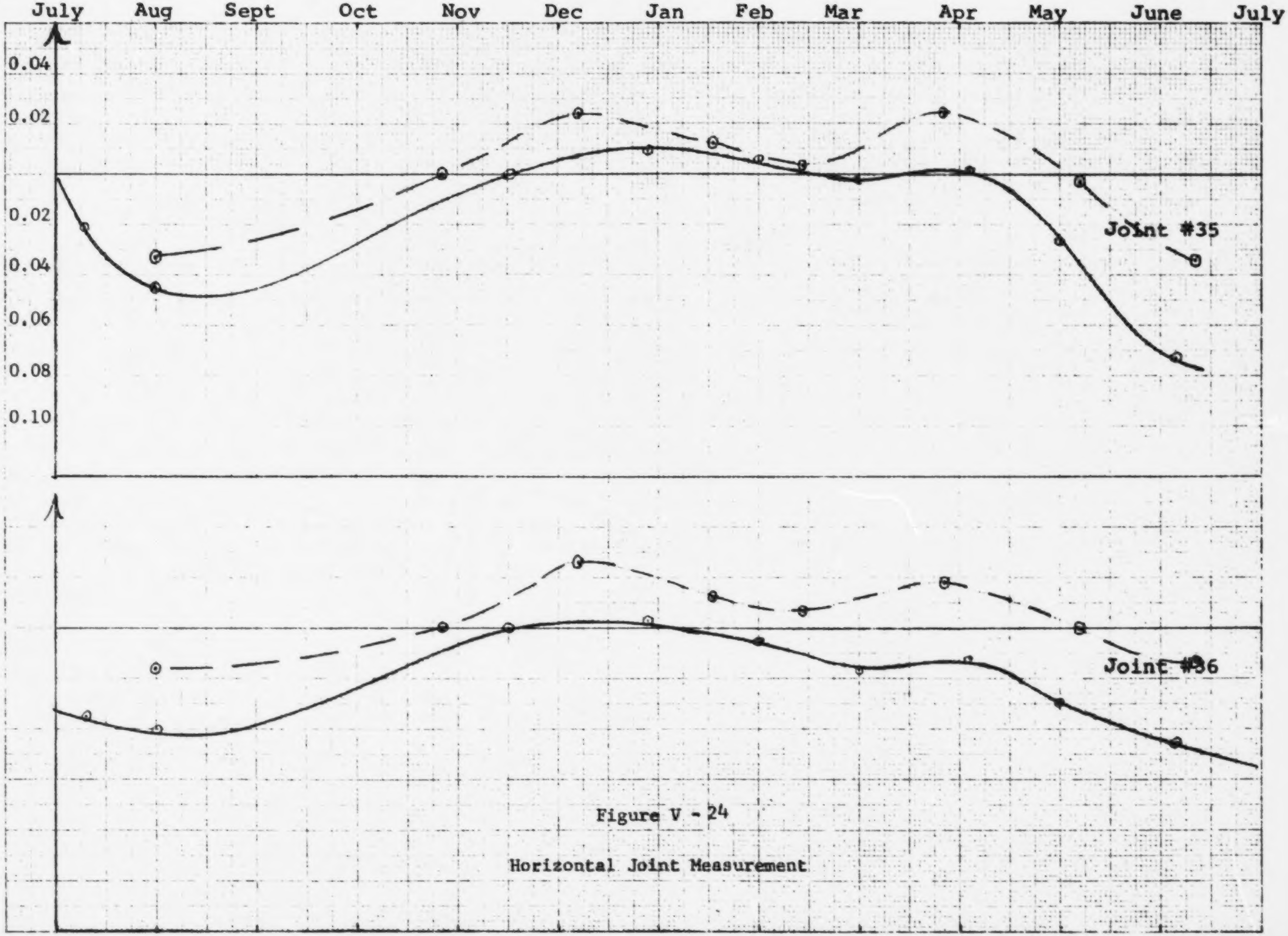


Figure V - 24

Horizontal Joint Measurement

10 X 10 TO THE CENTIMETER

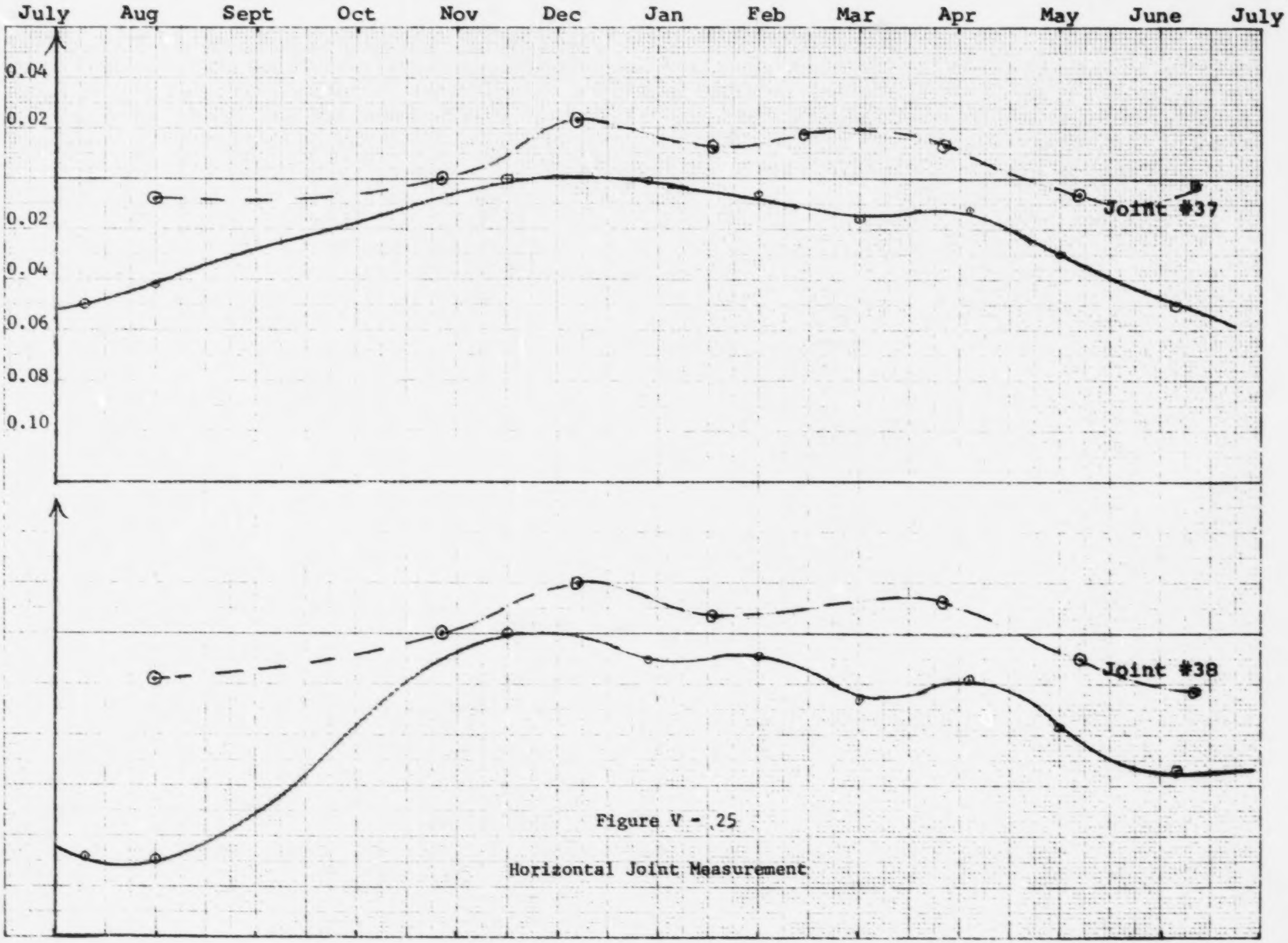


Figure V - 25

Horizontal Joint Measurement

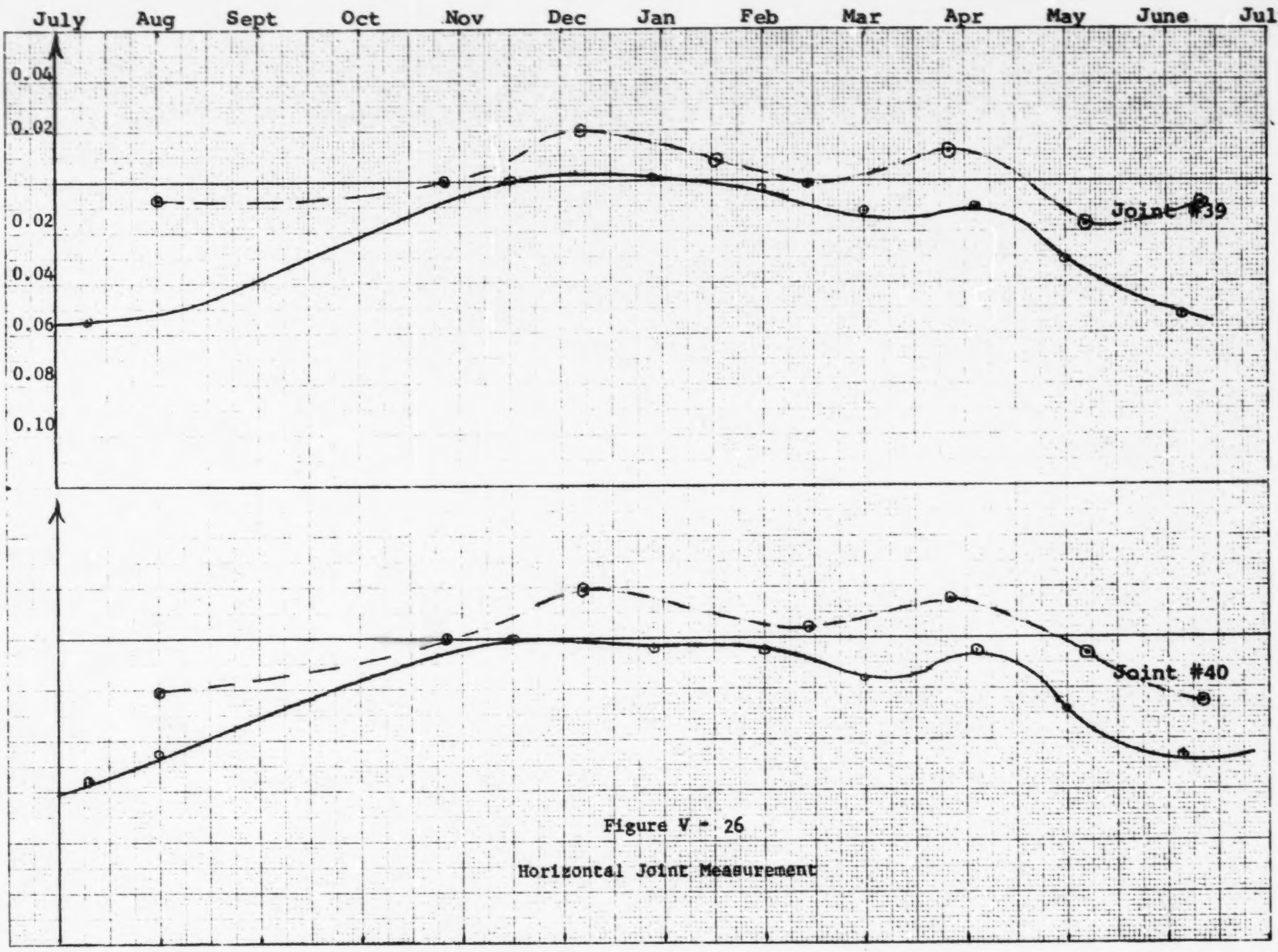


Figure V - 26

Horizontal Joint Measurement

10 X 10 TO THE CENTIMETER

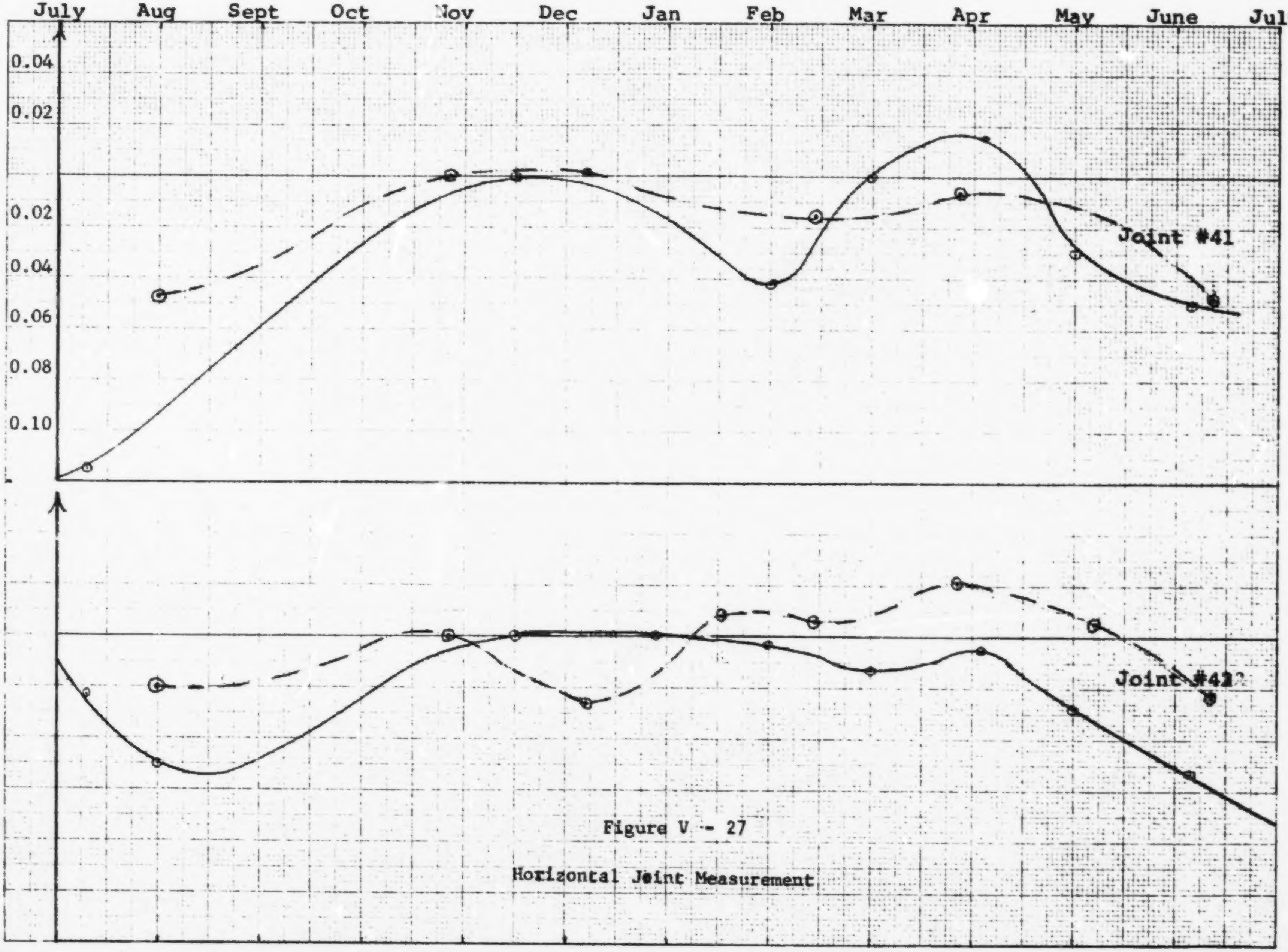


Figure V - 27

Horizontal Joint Measurement

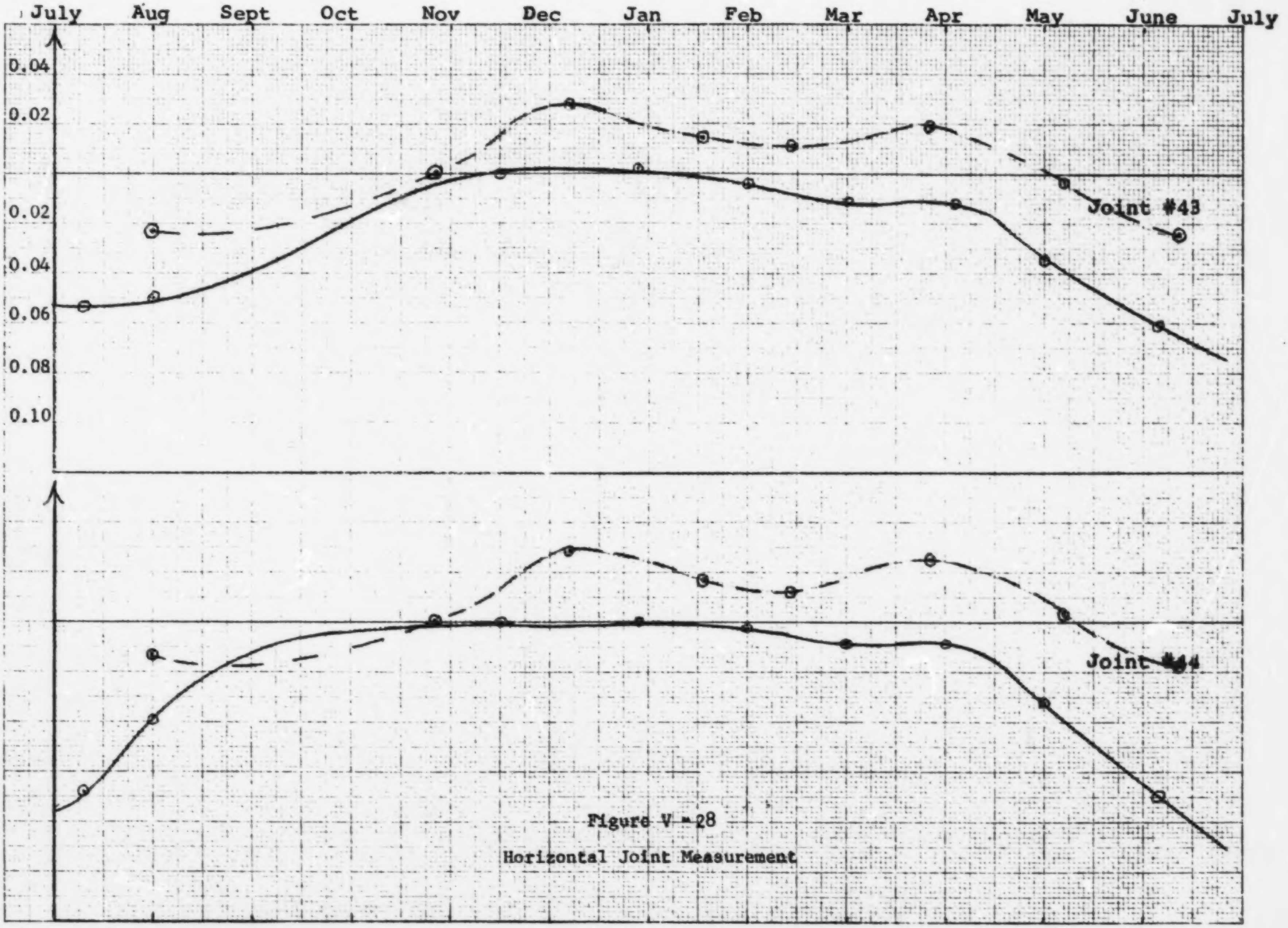


Figure V - 28

Horizontal Joint Measurement

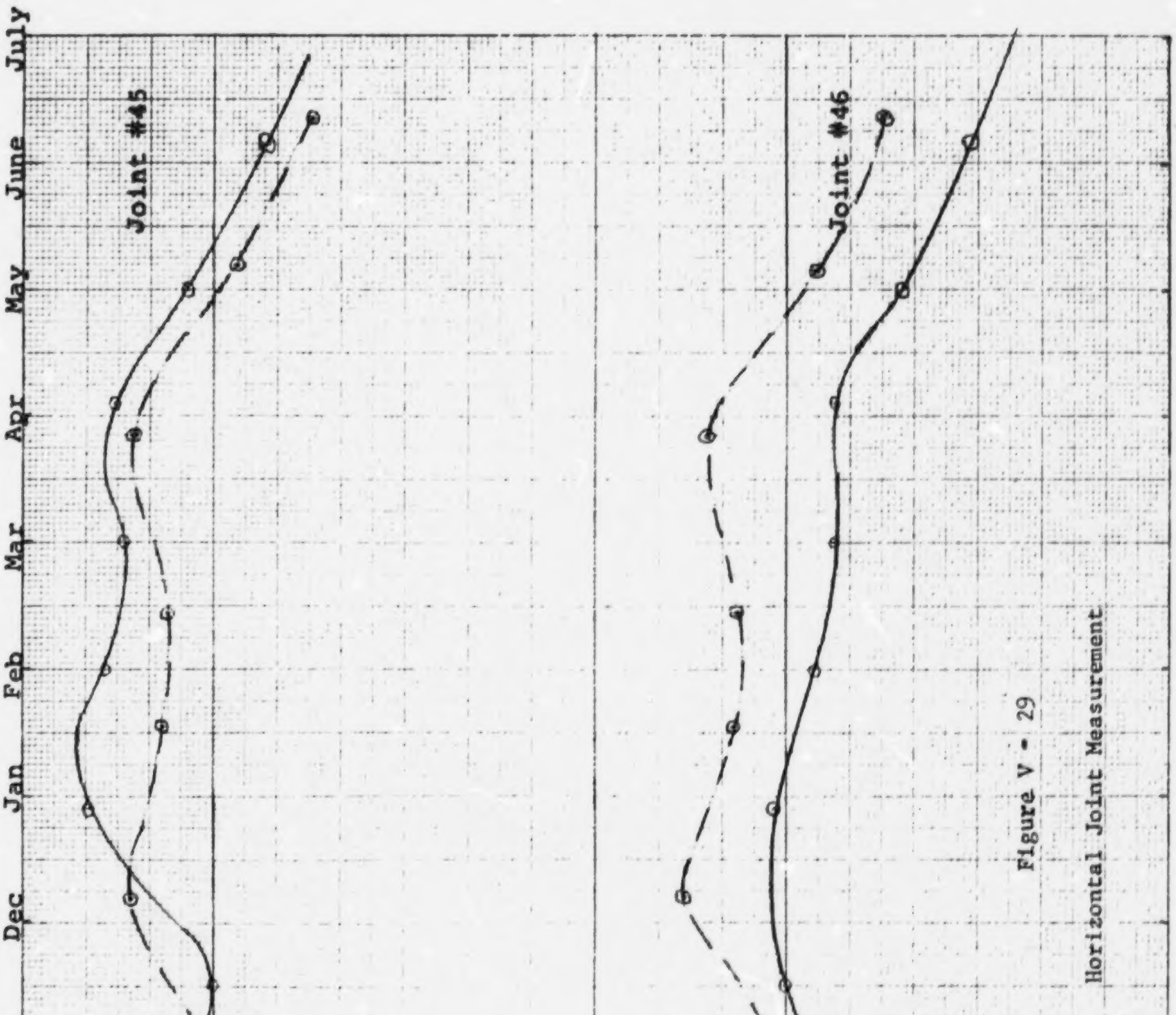


Figure V - 29

Horizontal Joint Measurement

10 X 10 TO THE CENTIMETER 46 1513

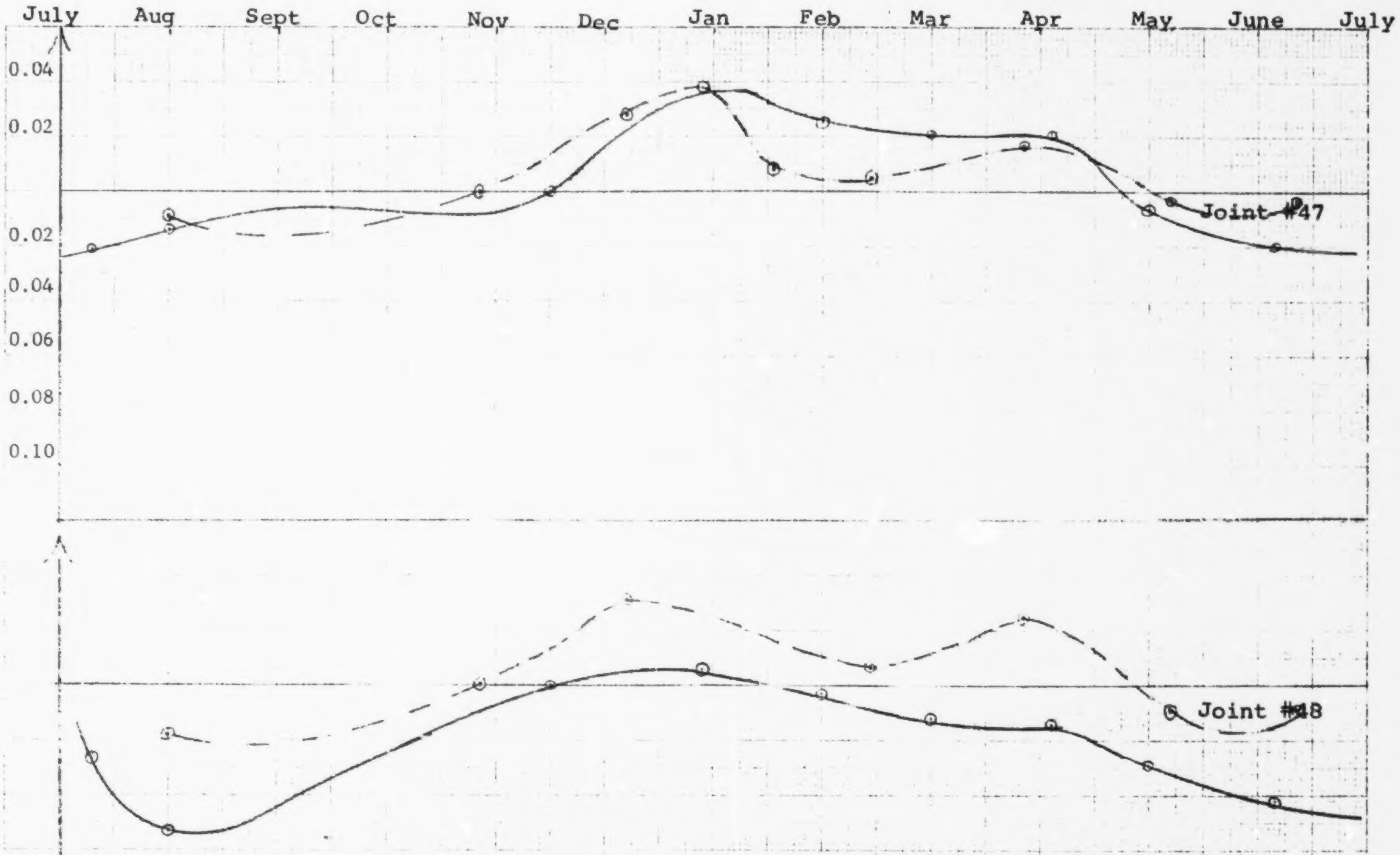


Figure V - 30

Horizontal Joint Measurement

10 X 10 TO THE CENTIMETER 46 1523
KEUFFEL & ESSER CO.

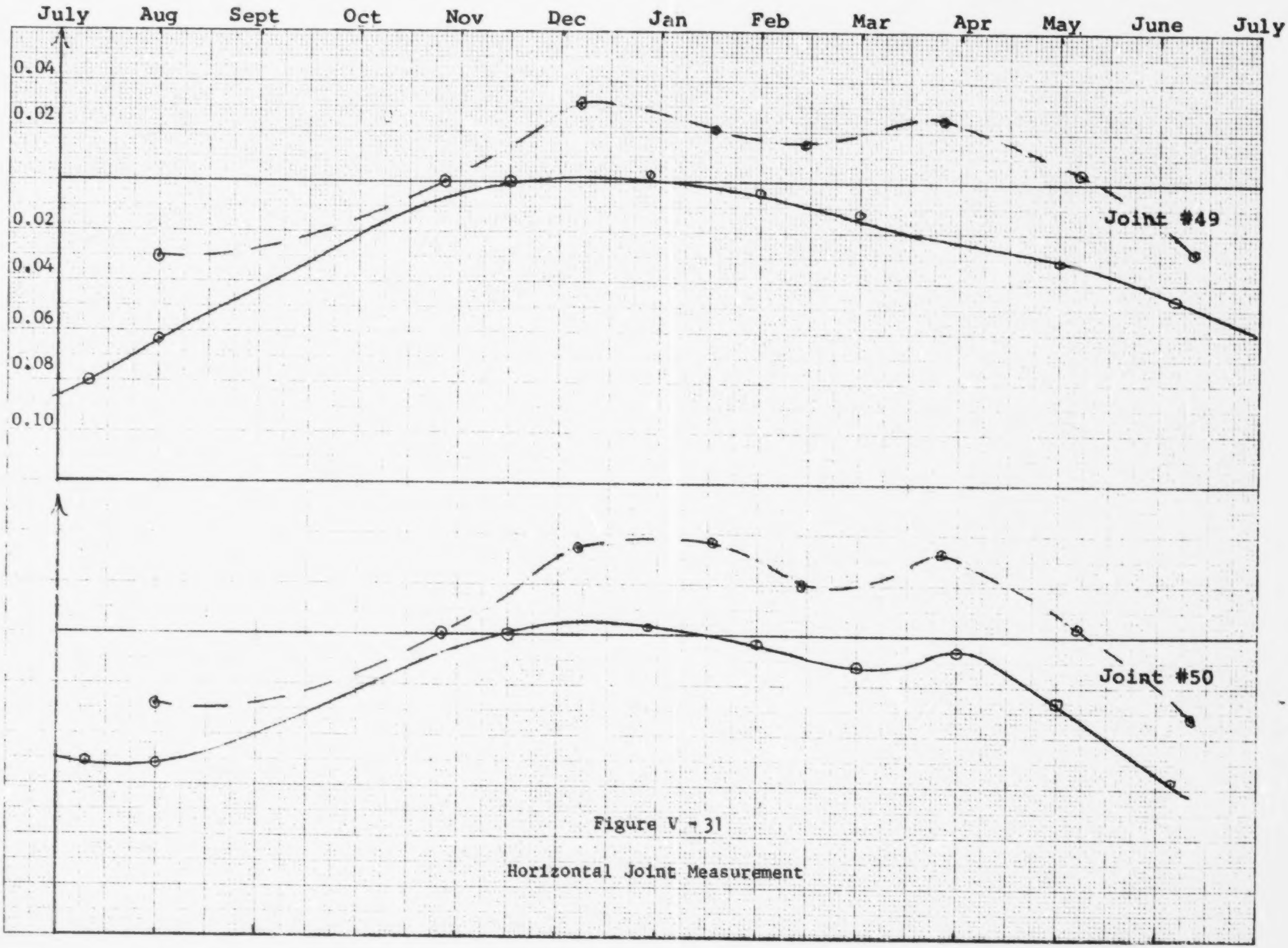


Figure V - 31

Horizontal Joint Measurement

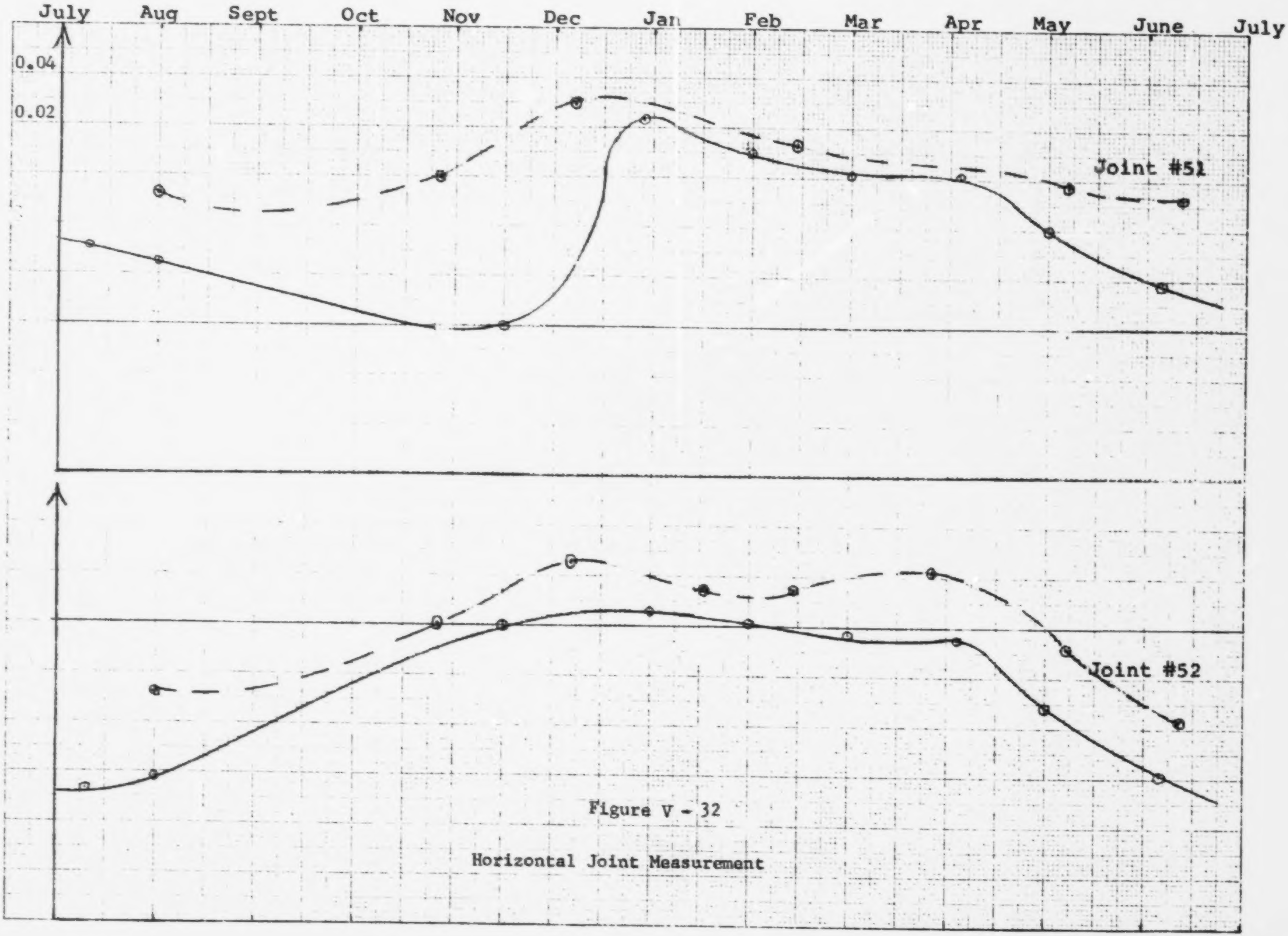


Figure V - 32

Horizontal Joint Measurement

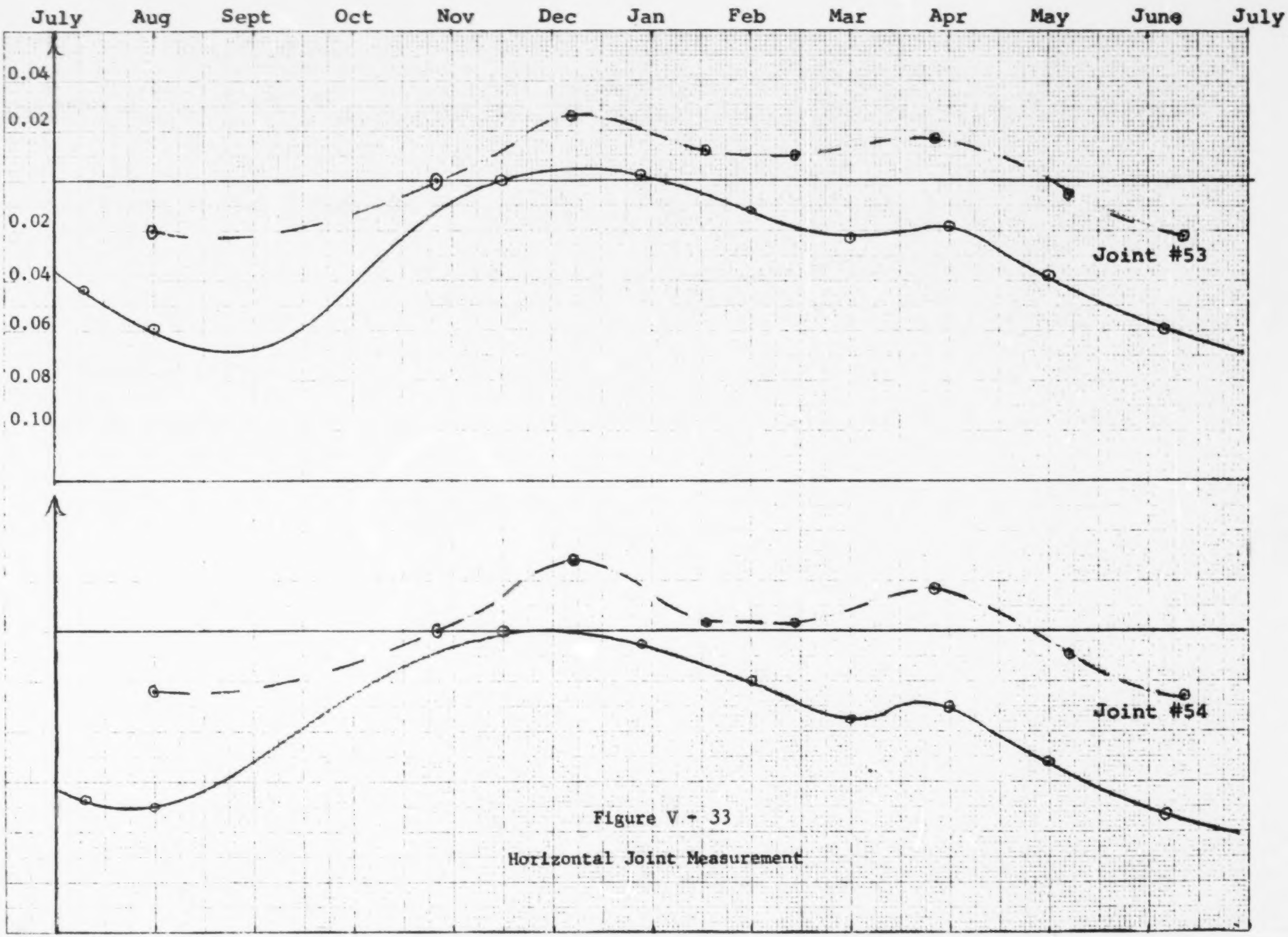


Figure V - 33

Horizontal Joint Measurement

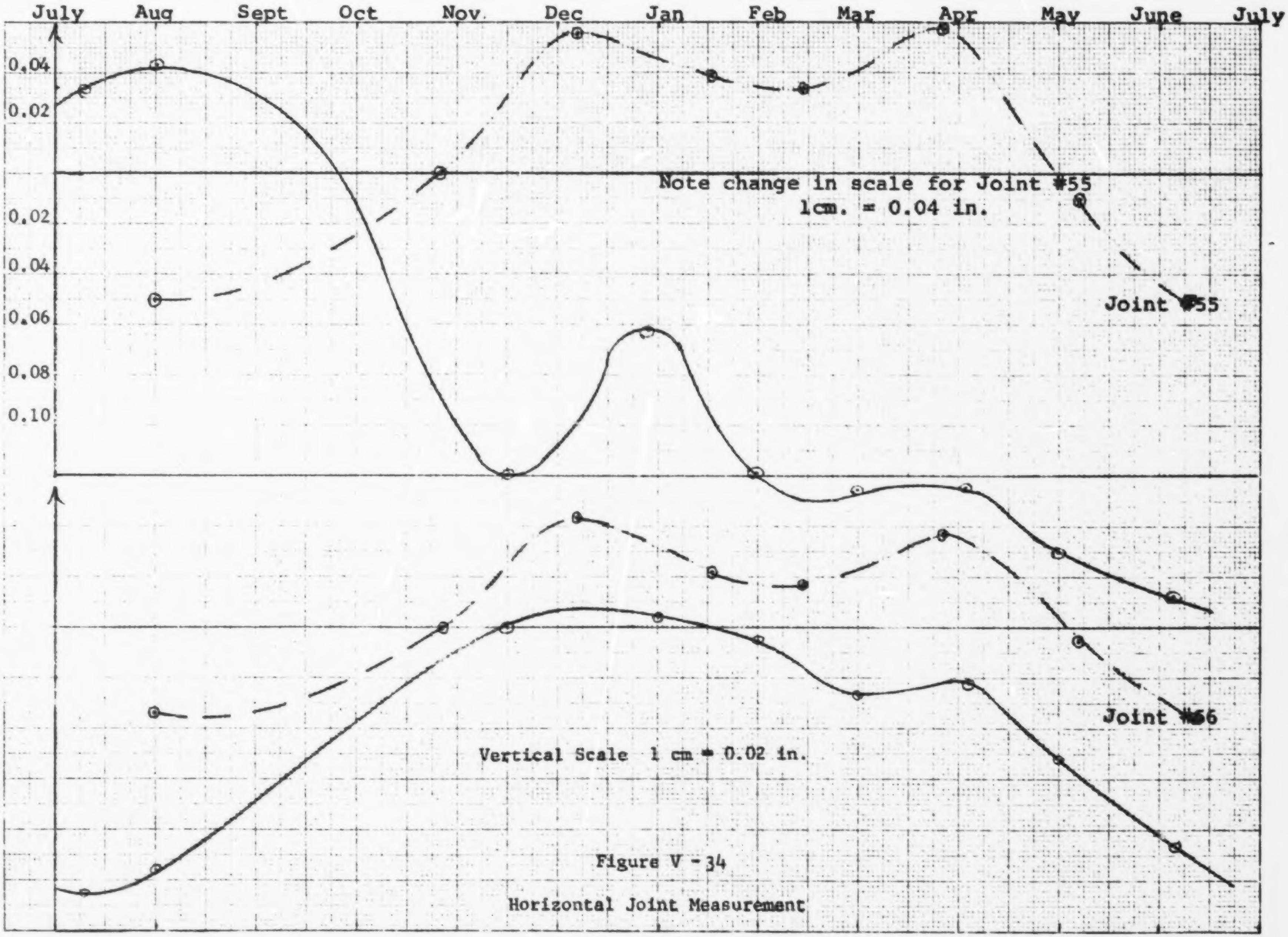


Figure V - 34

Horizontal Joint Measurement

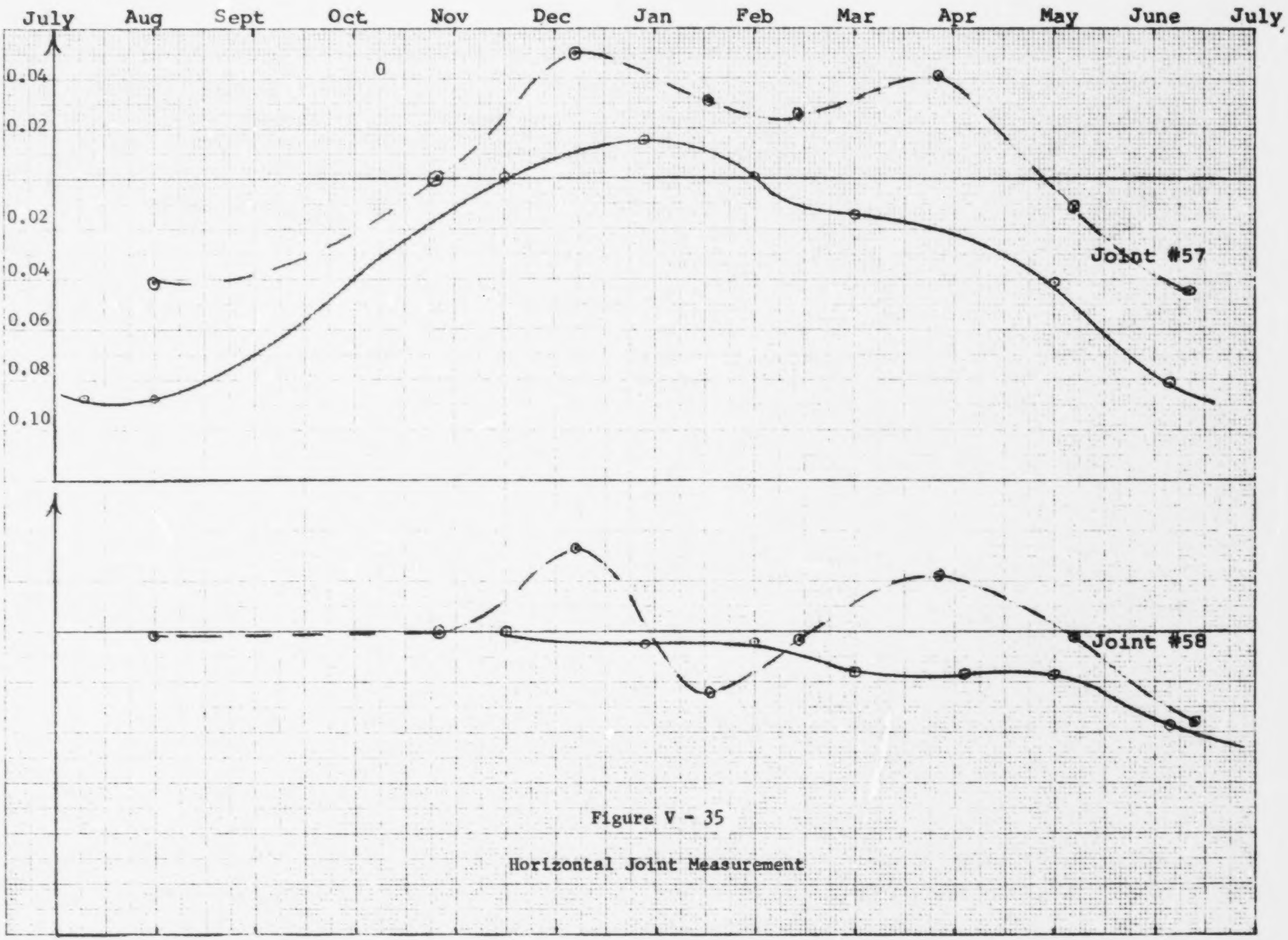


Figure V - 35

Horizontal Joint Measurement

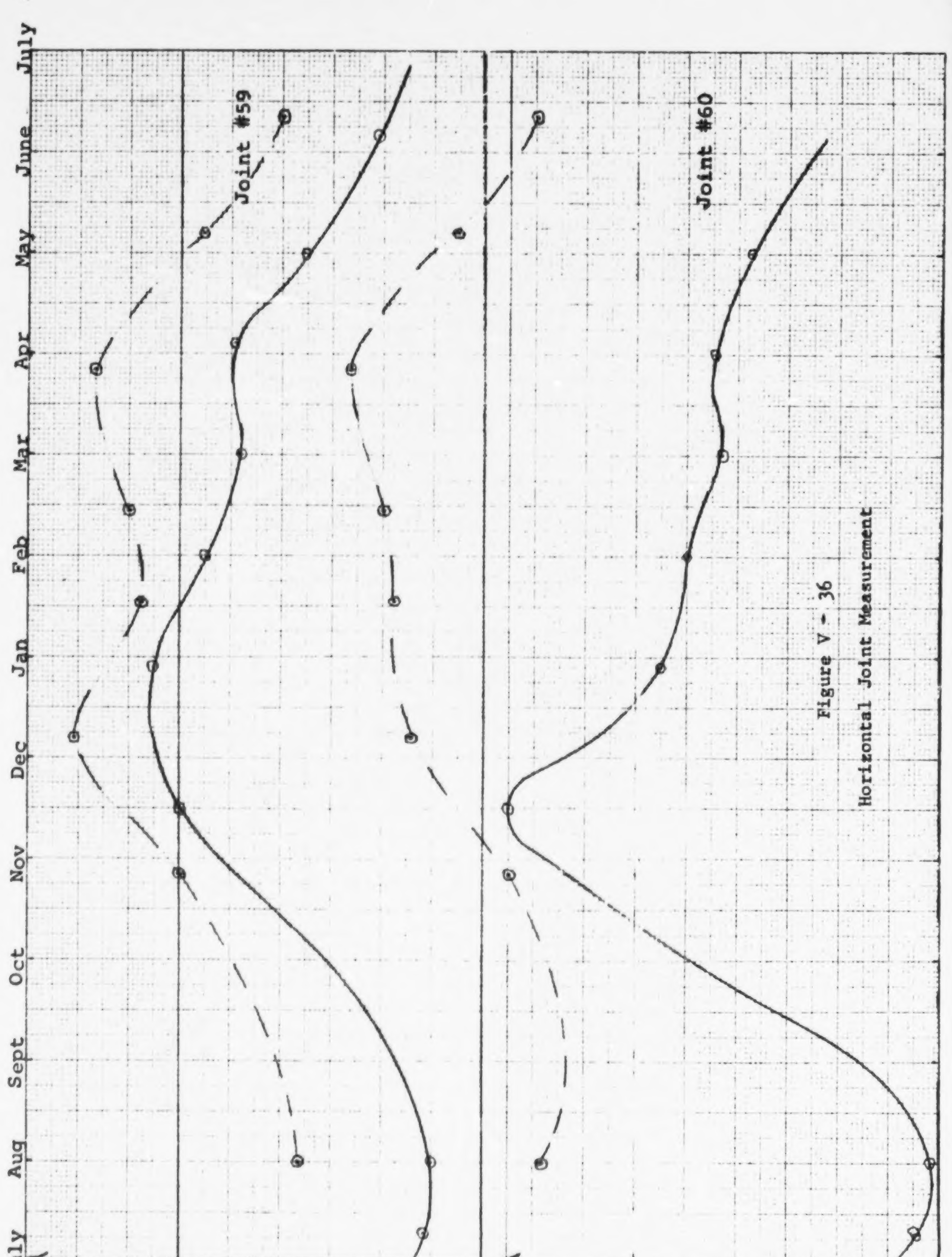


Figure V - 36

Horizontal Joint Measurement

10 X 10 TO THE CENTIMETER 46 1521
KEUFFEL & ESSER CO.

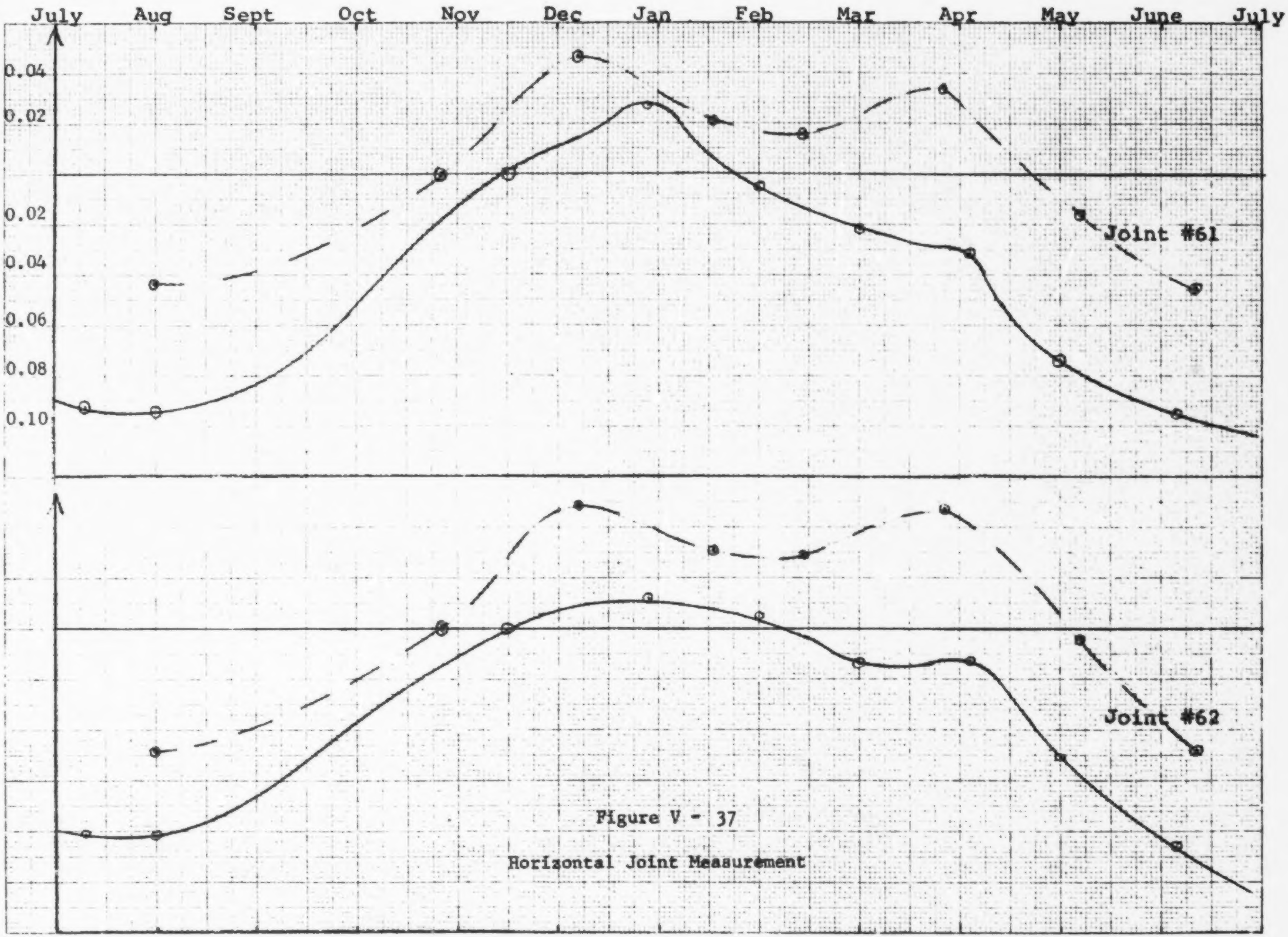


Figure V - 37

Horizontal Joint Measurement

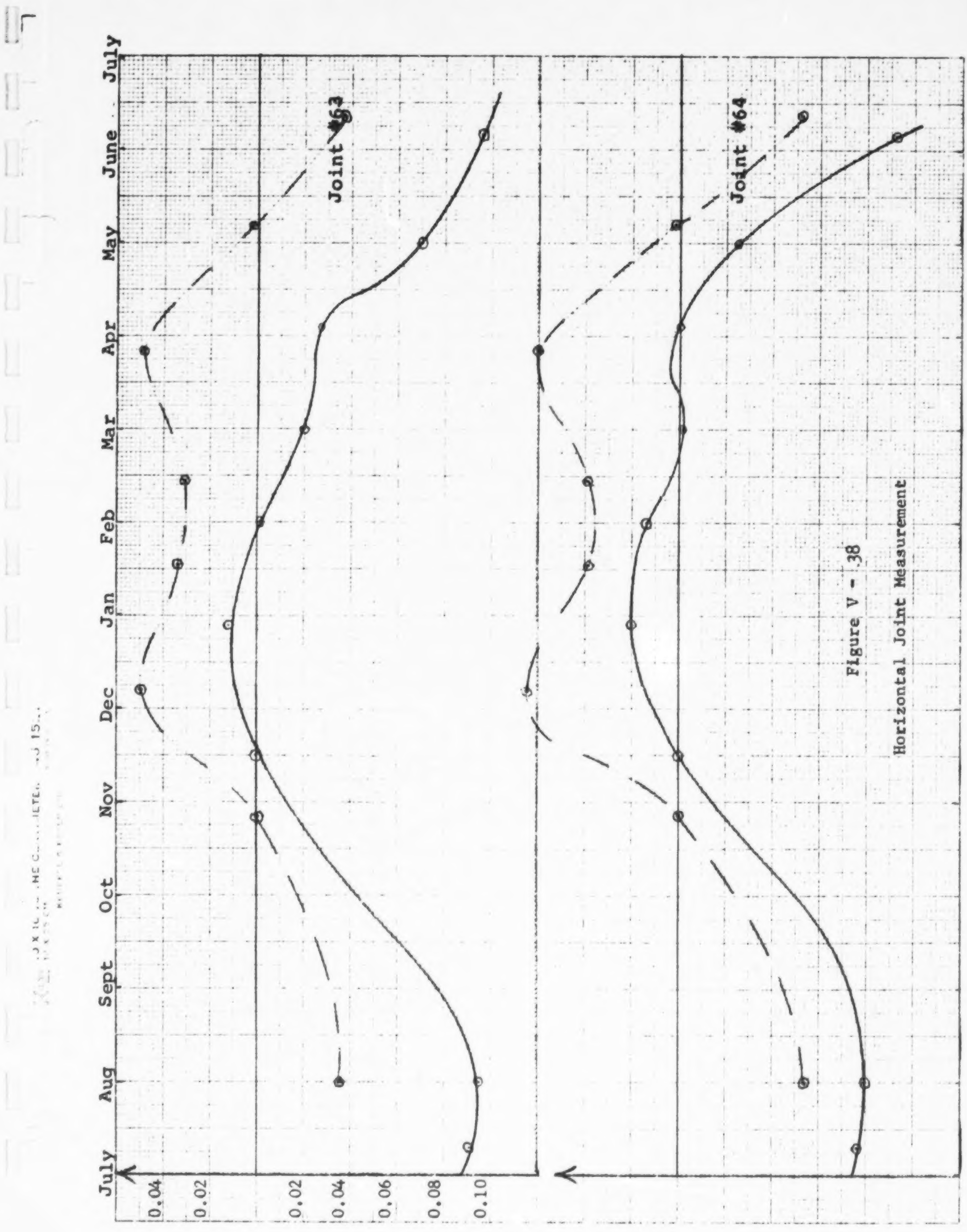


Figure V - 38

Horizontal Joint Measurement

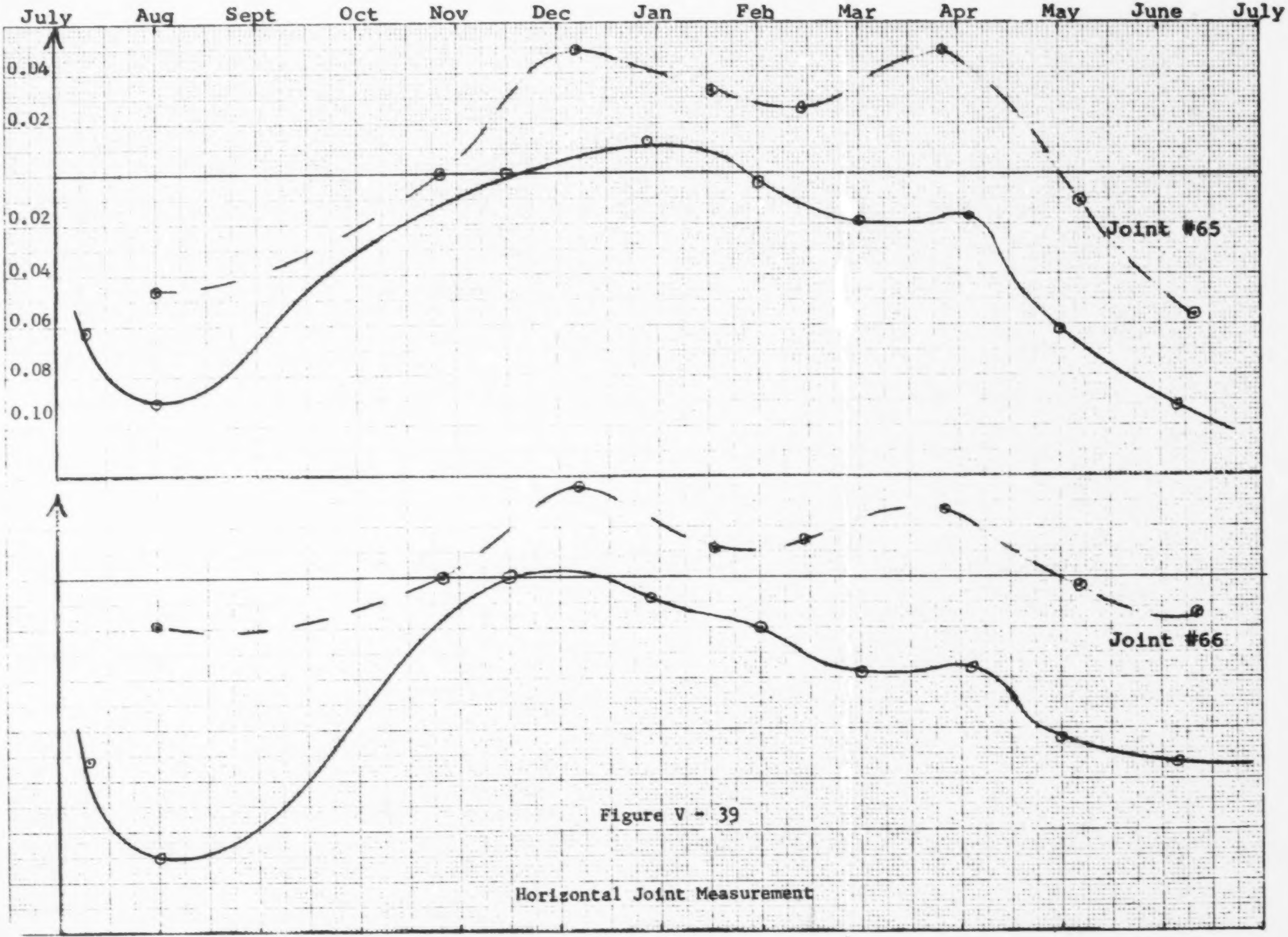


Figure V - 39

Horizontal Joint Measurement

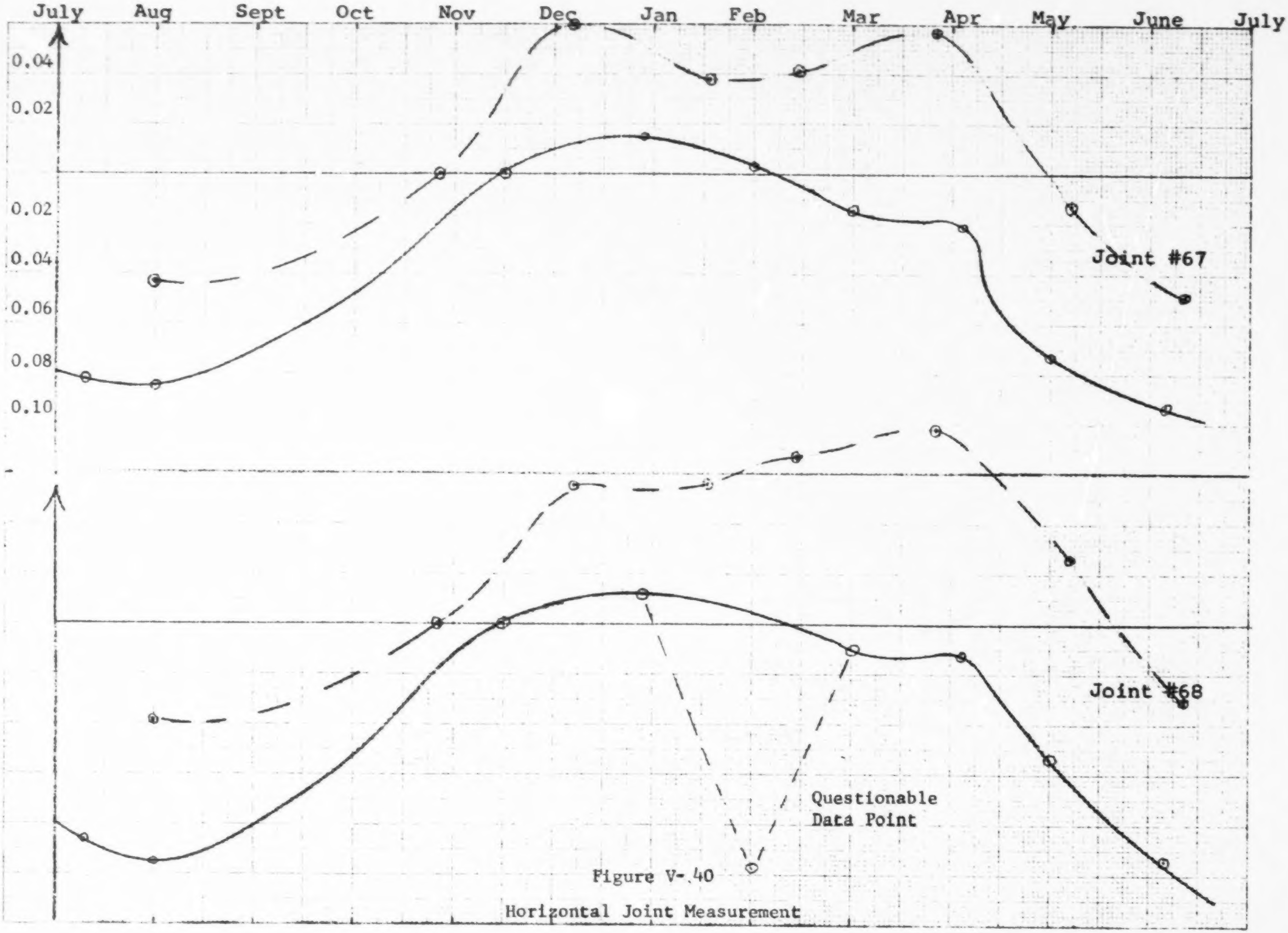


Figure V-40

Horizontal Joint Measurement

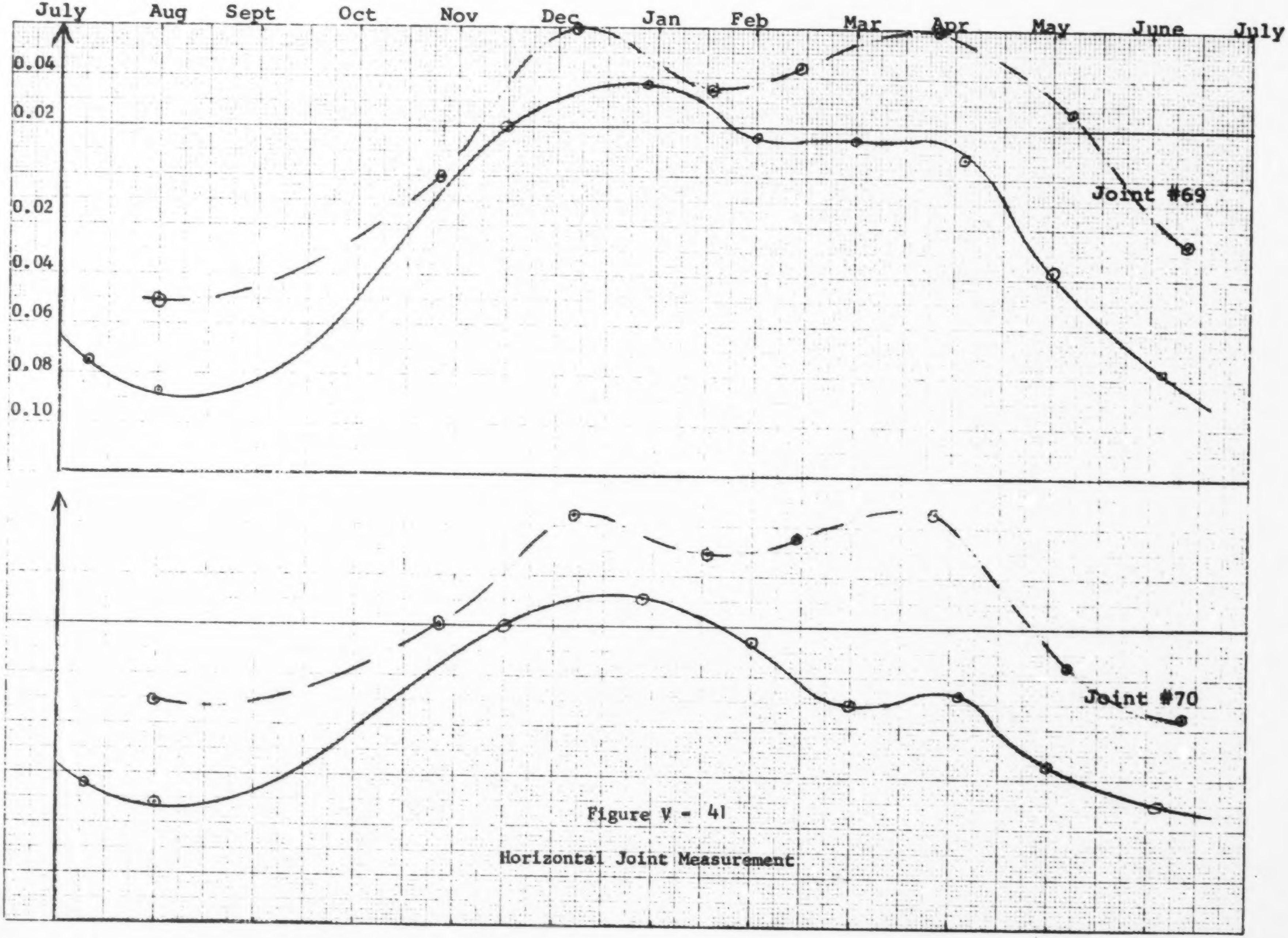


Figure V - 41

Horizontal Joint Measurement

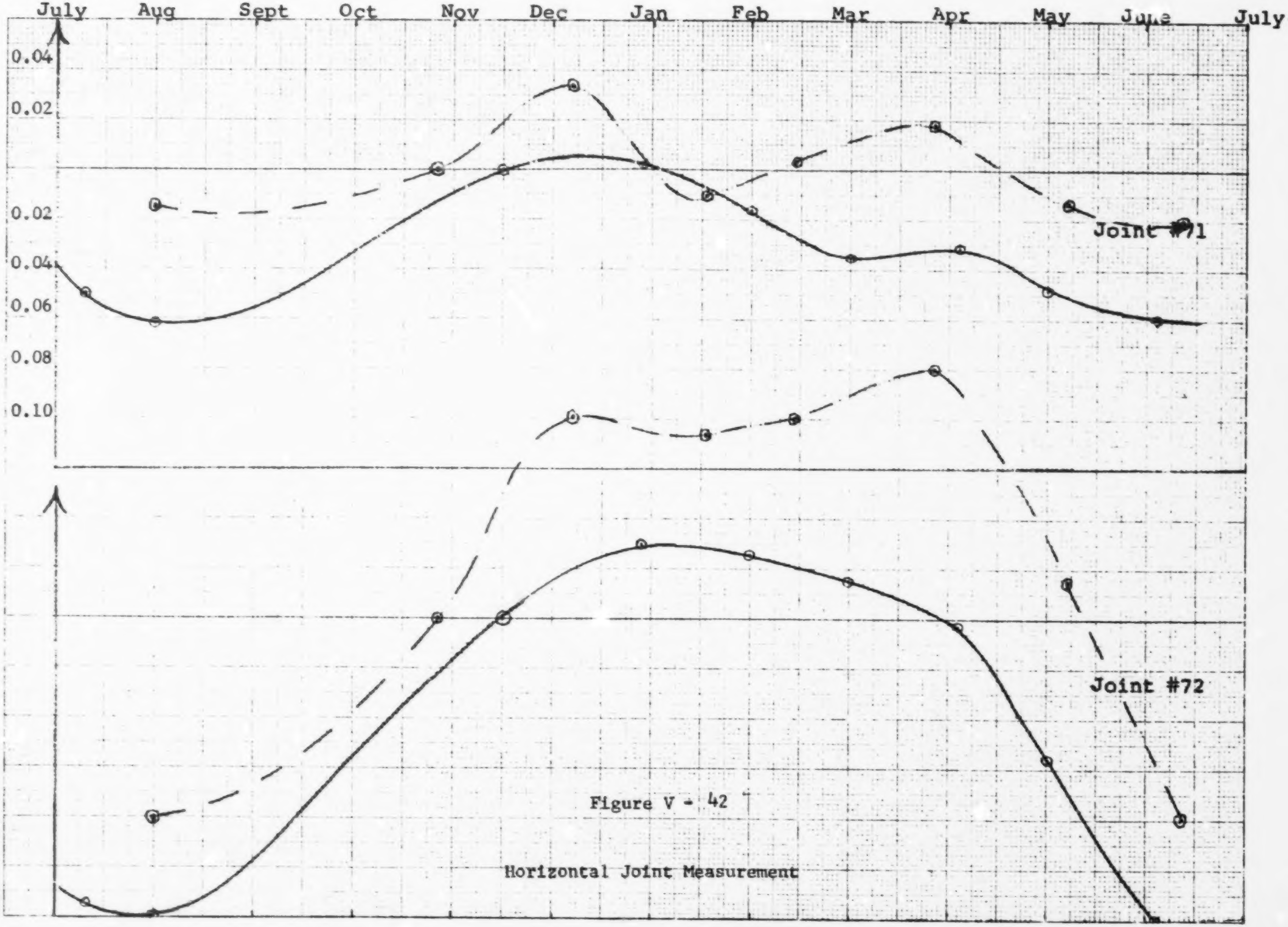


Figure V - 42

Horizontal Joint Measurement

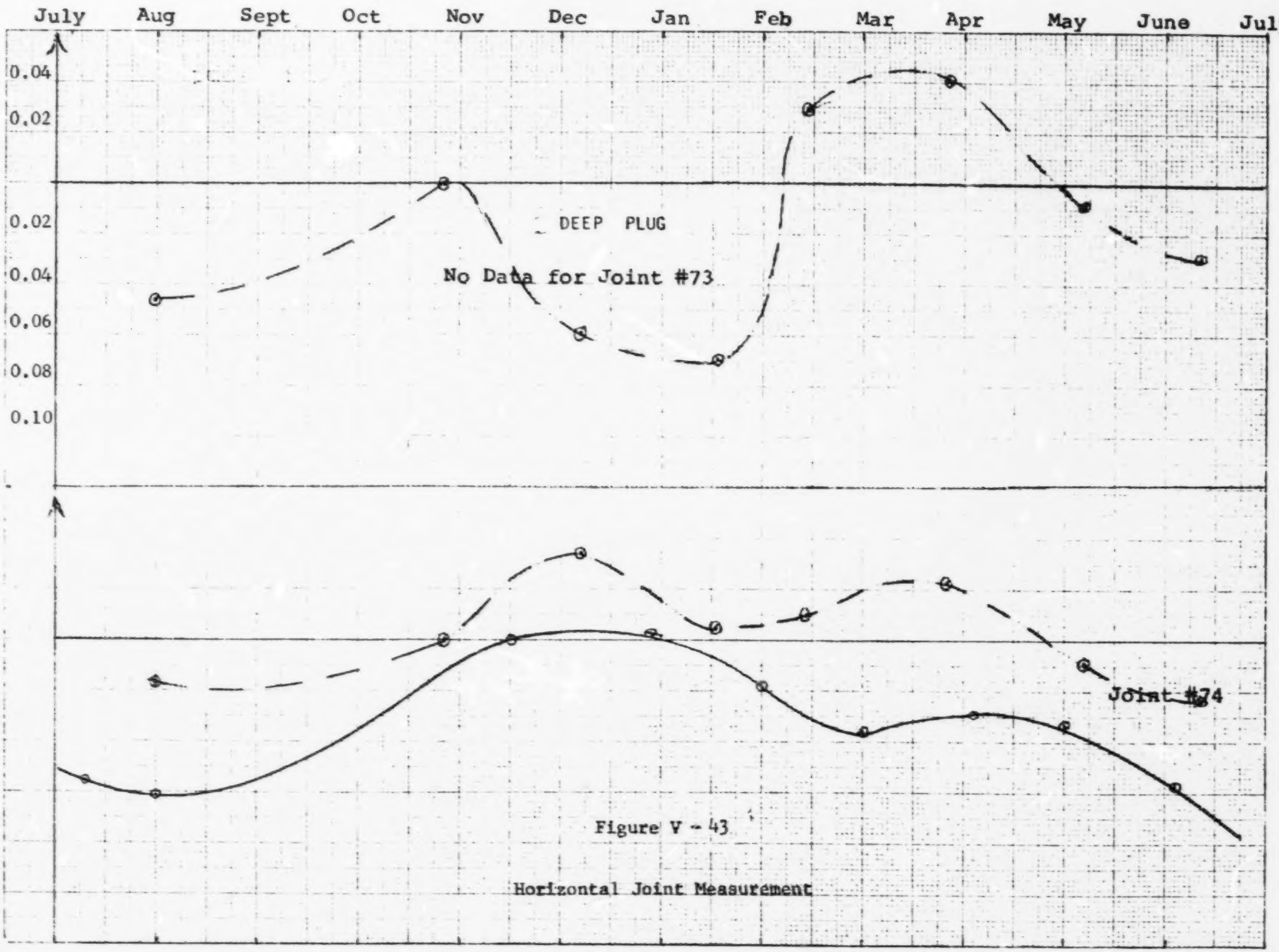


Figure V - 43

Horizontal Joint Measurement

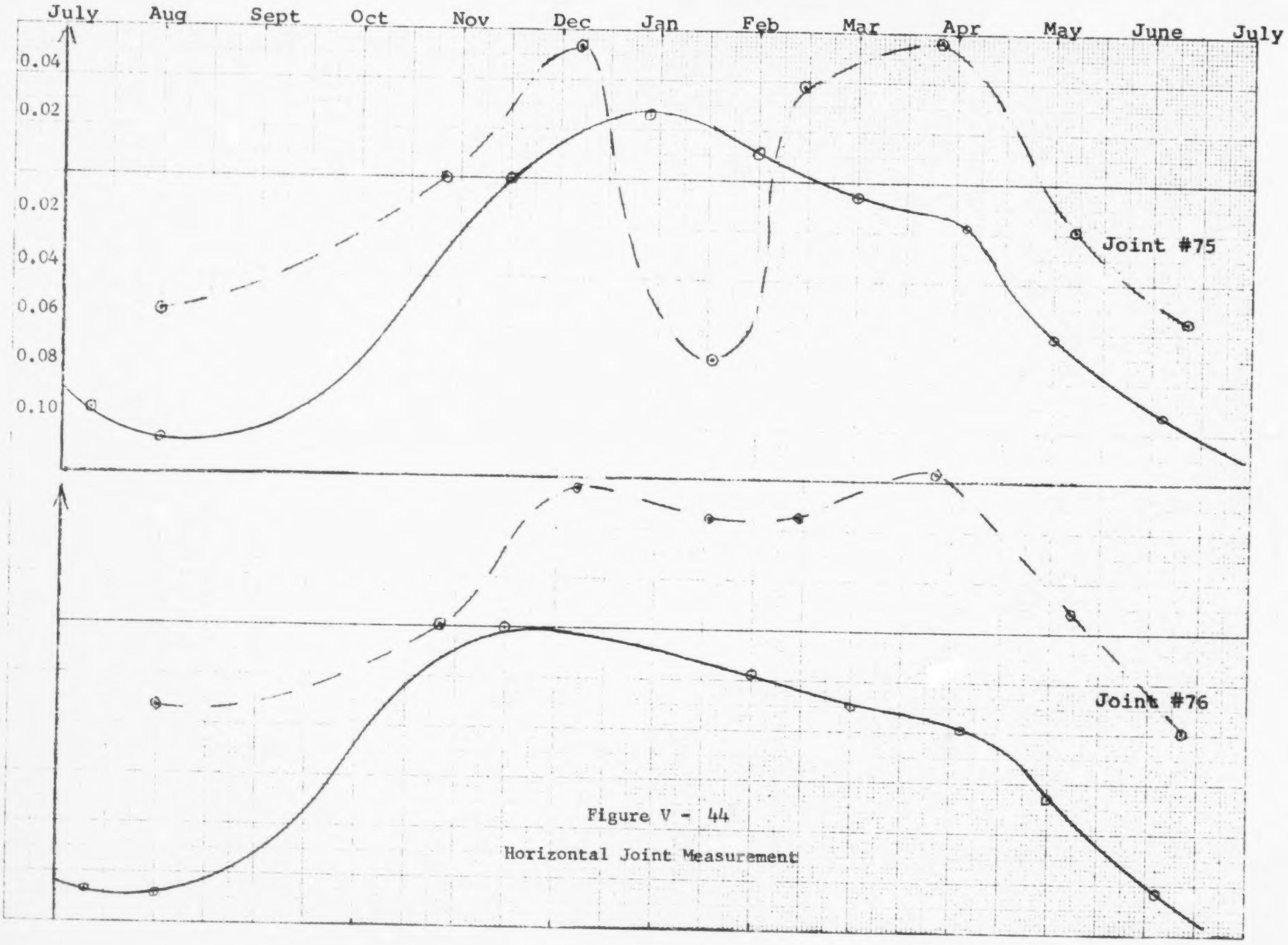


Figure V - 44

Horizontal Joint Measurement

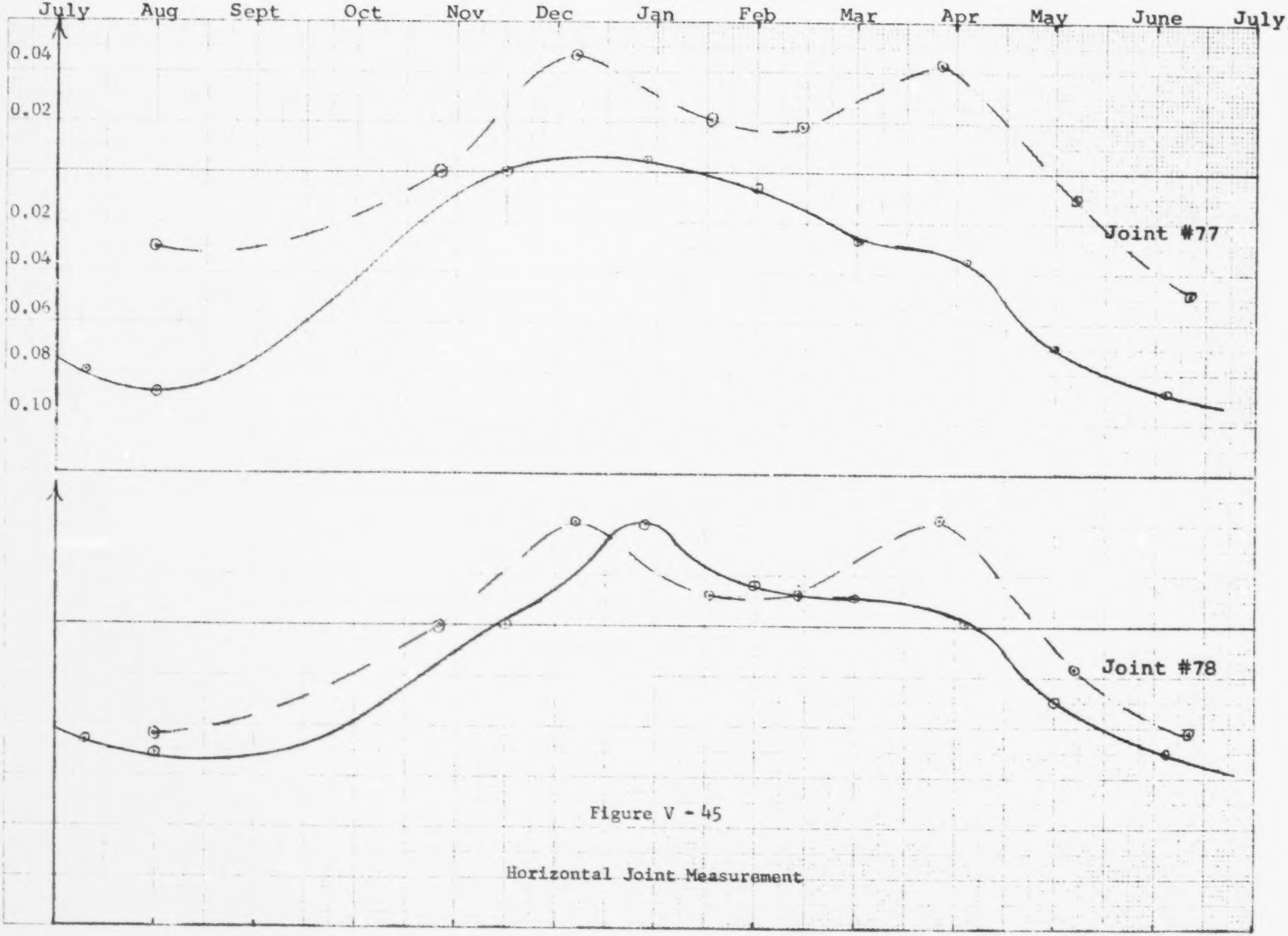


Figure V - 45

Horizontal Joint Measurement

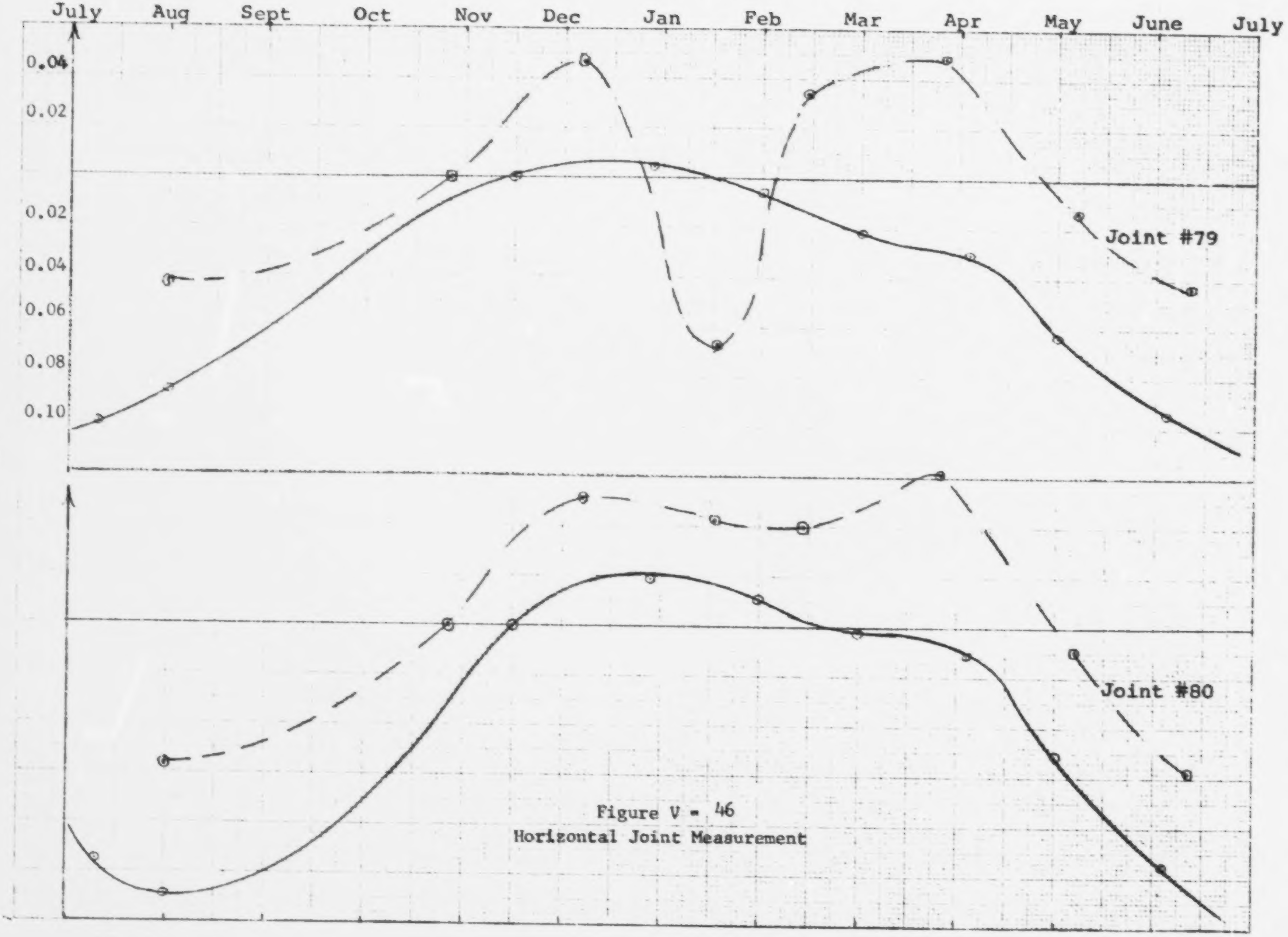


Figure V - 46
Horizontal Joint Measurement

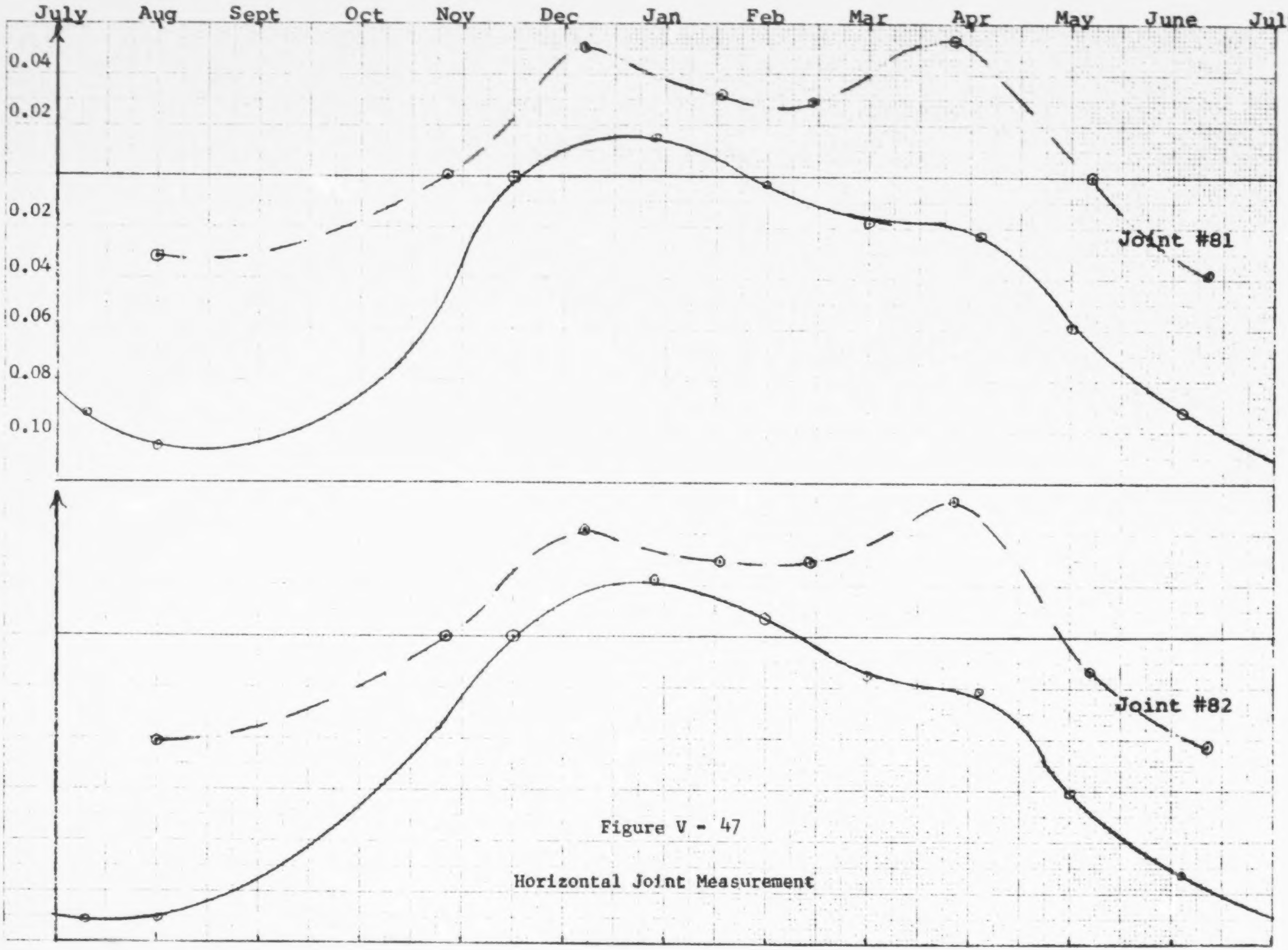


Figure V - 47

Horizontal Joint Measurement

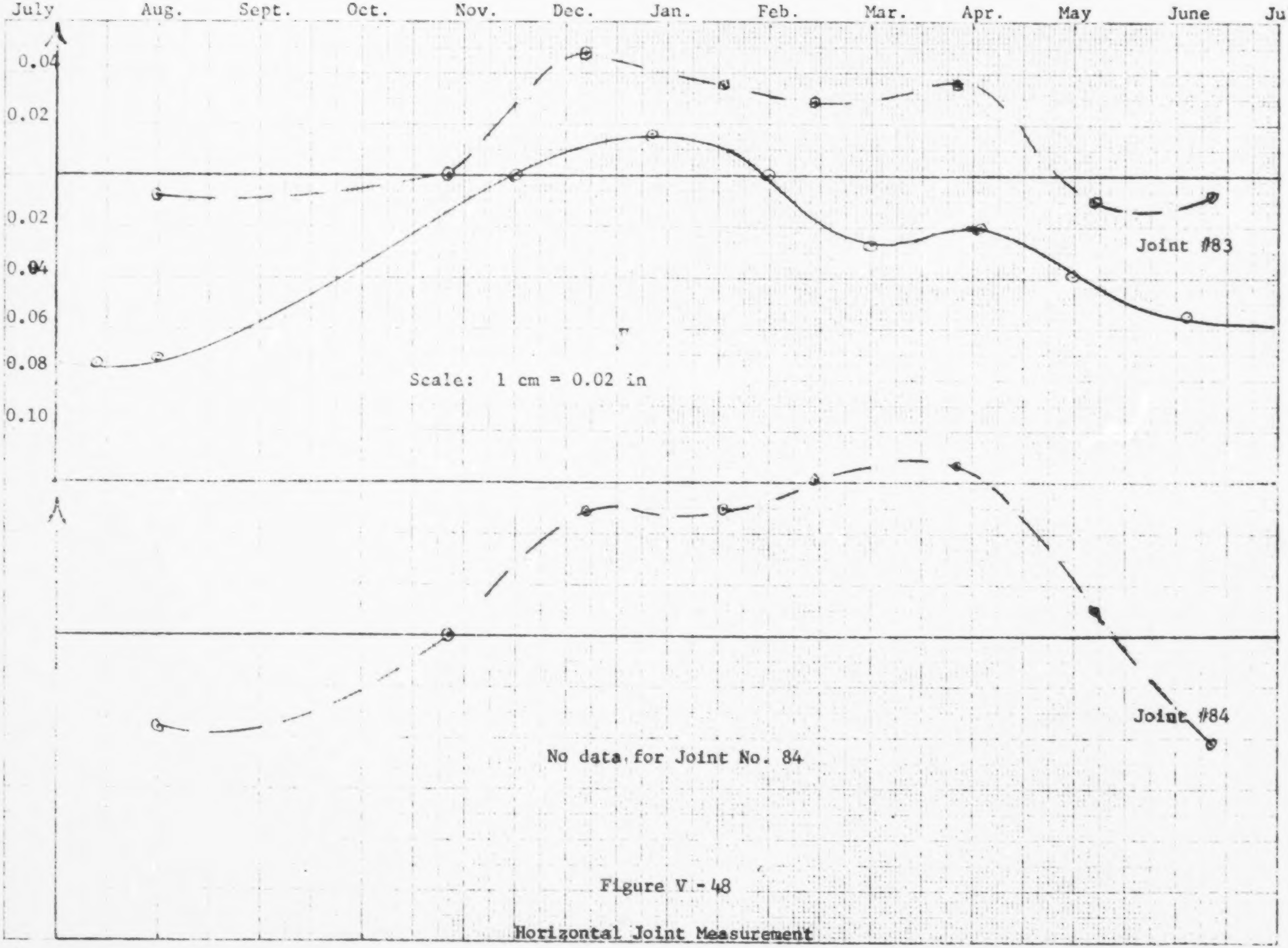


Figure V - 48

Horizontal Joint Measurement

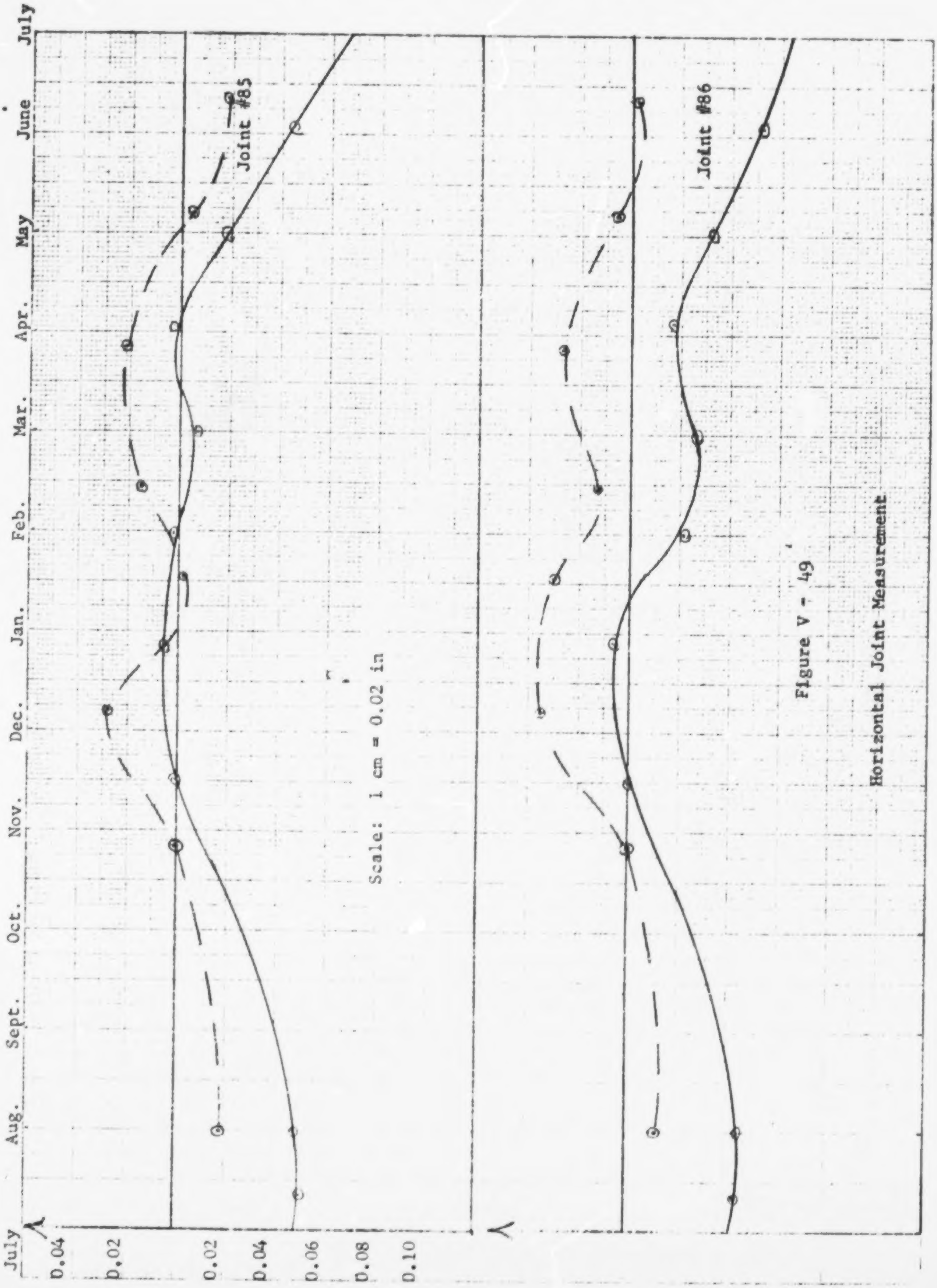


Figure V - 49

Horizontal Joint Measurement

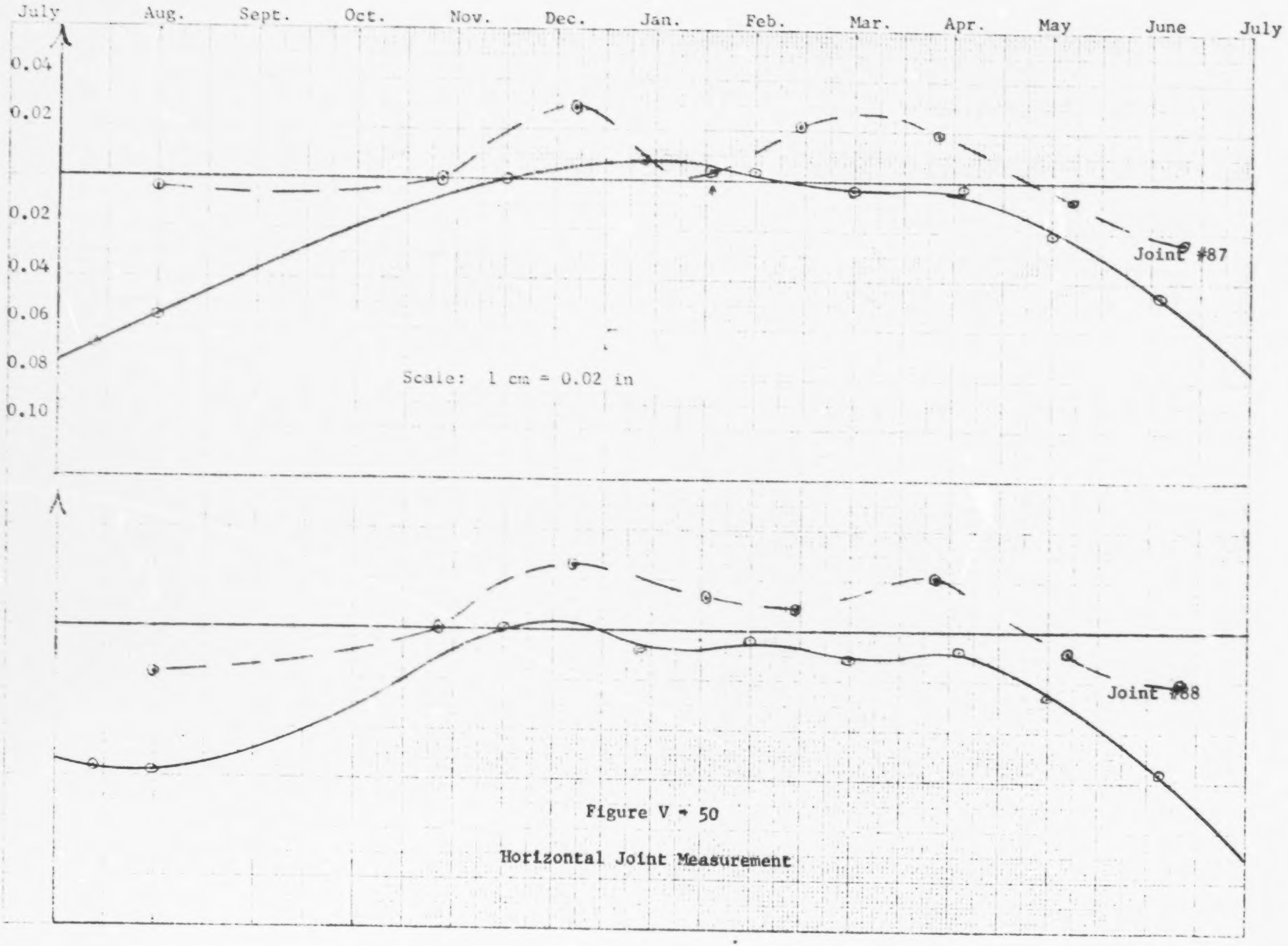


Figure V - 50

Horizontal Joint Measurement

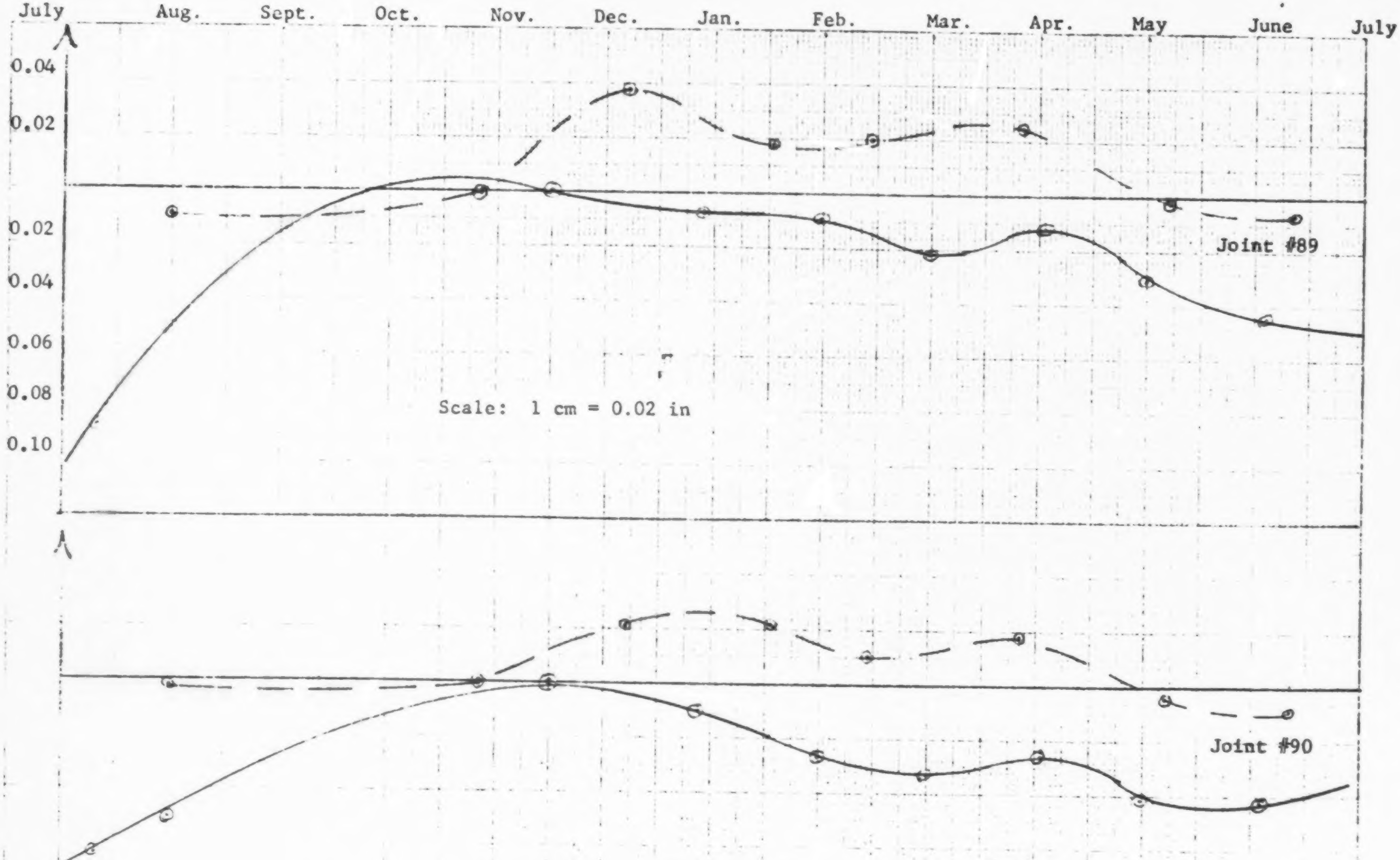


Figure V -5h

Horizontal Joint Measurement

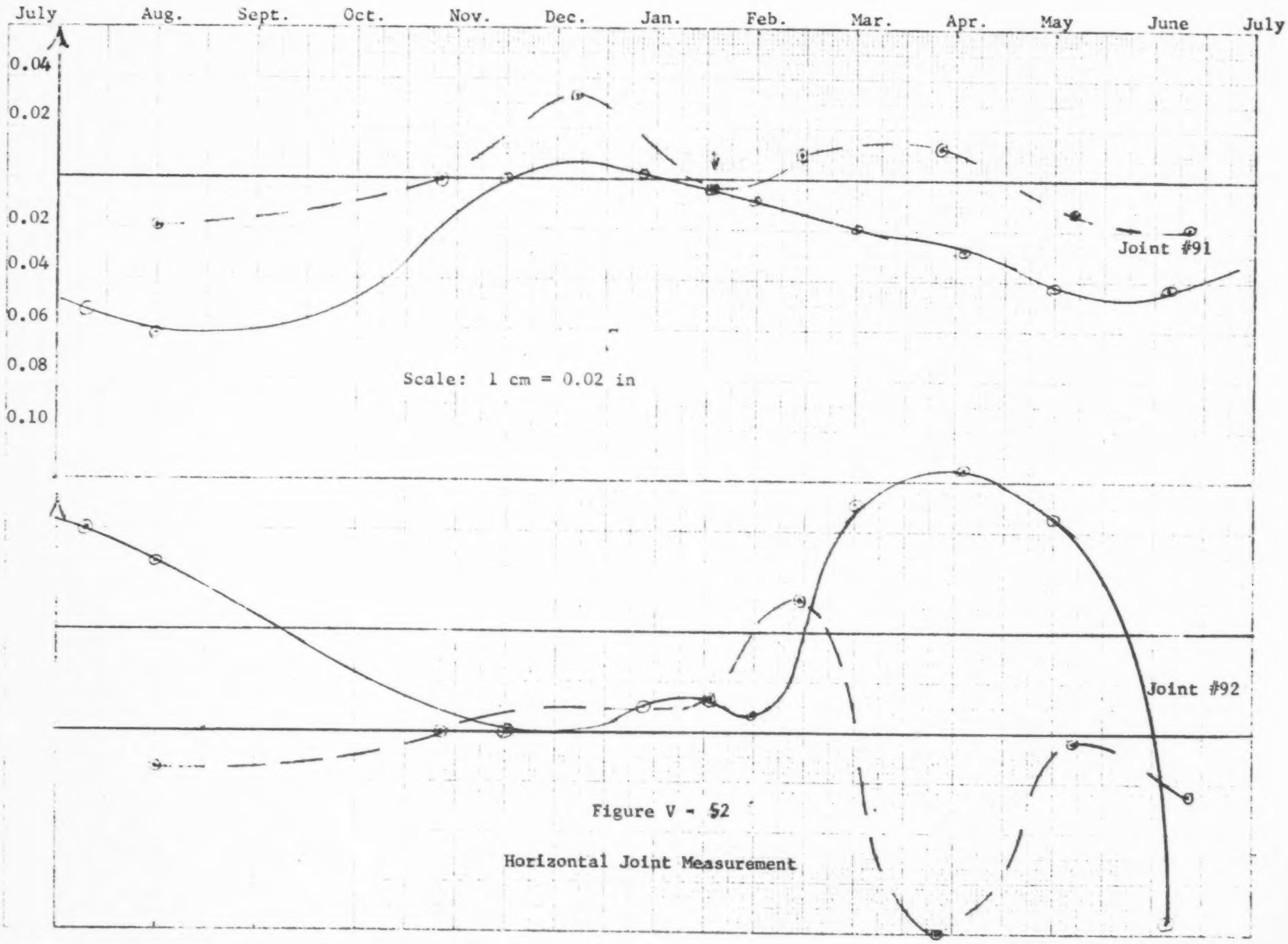


Figure V - 52

Horizontal Joint Measurement

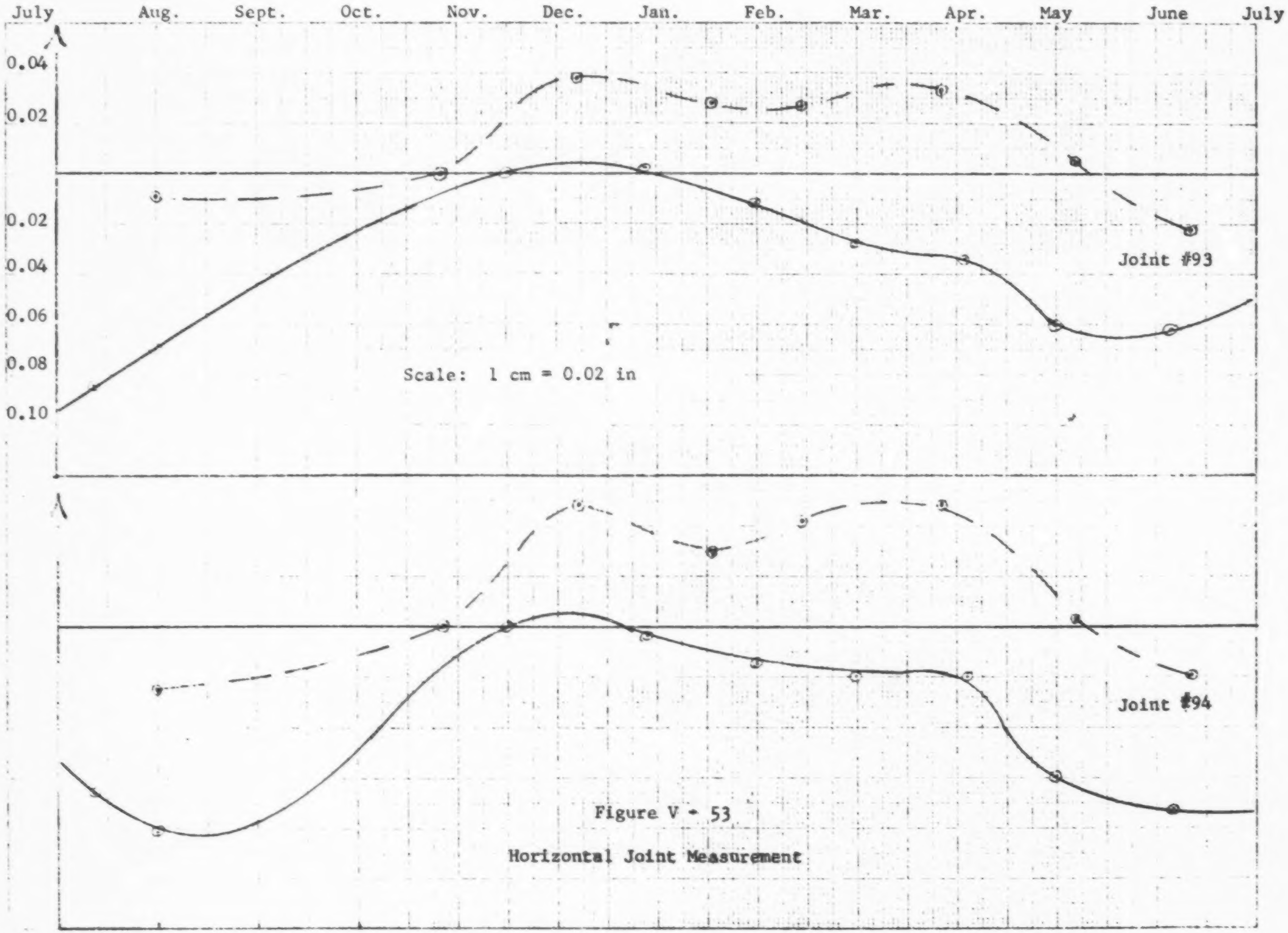
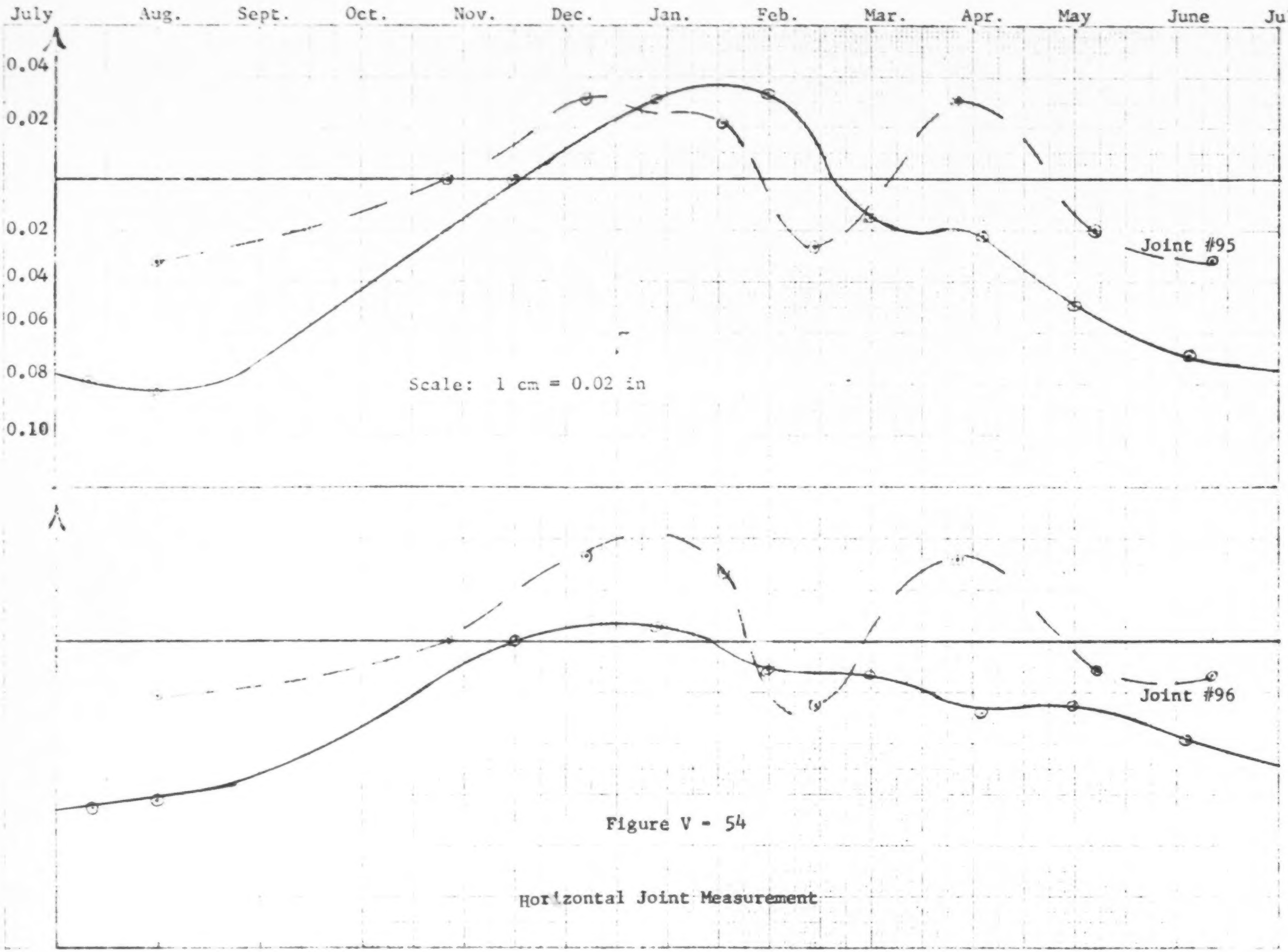


Figure V - 53

Horizontal Joint Measurement



Scale: 1 cm = 0.02 in

Figure V - 54

Horizontal Joint Measurement

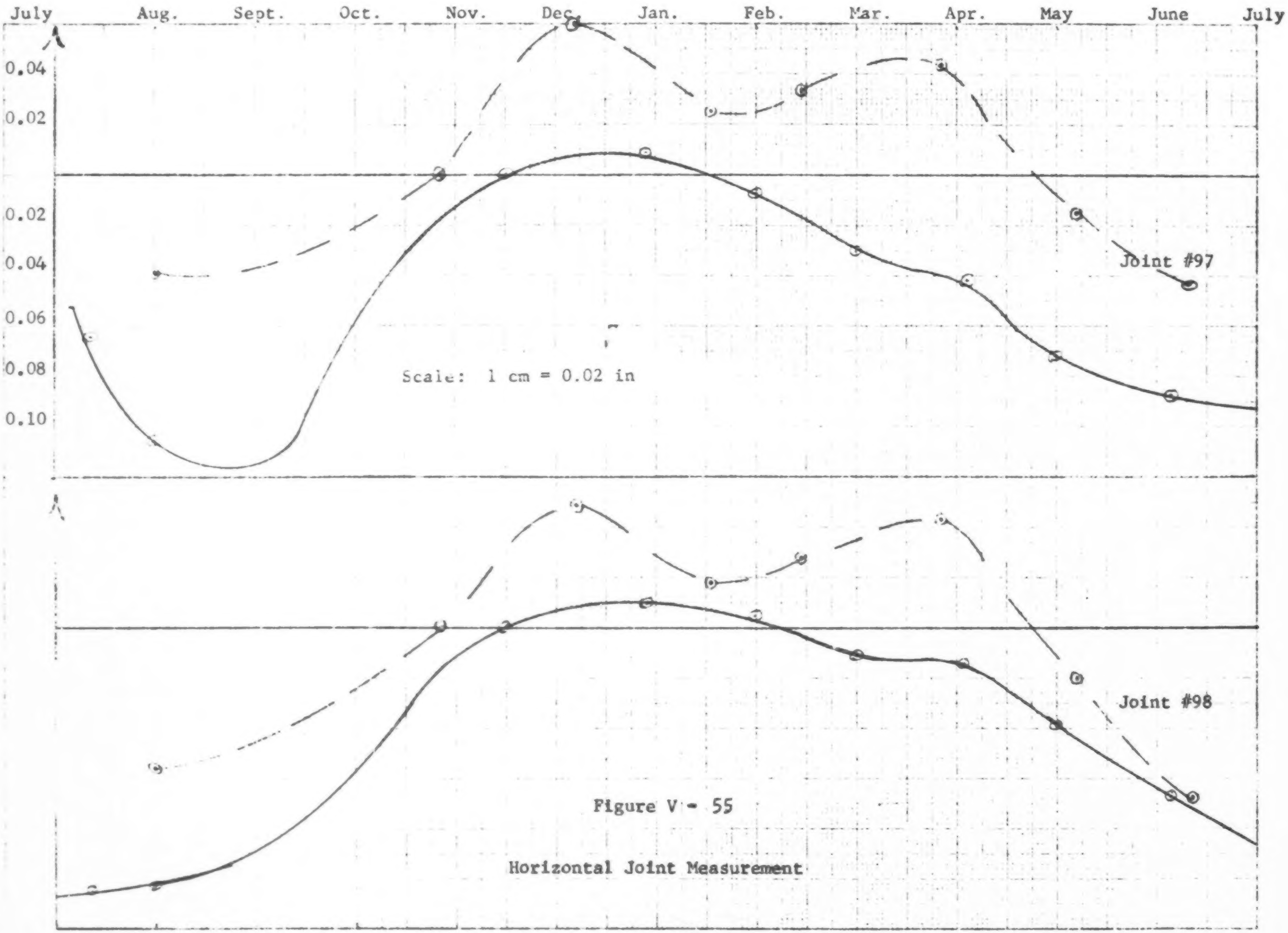
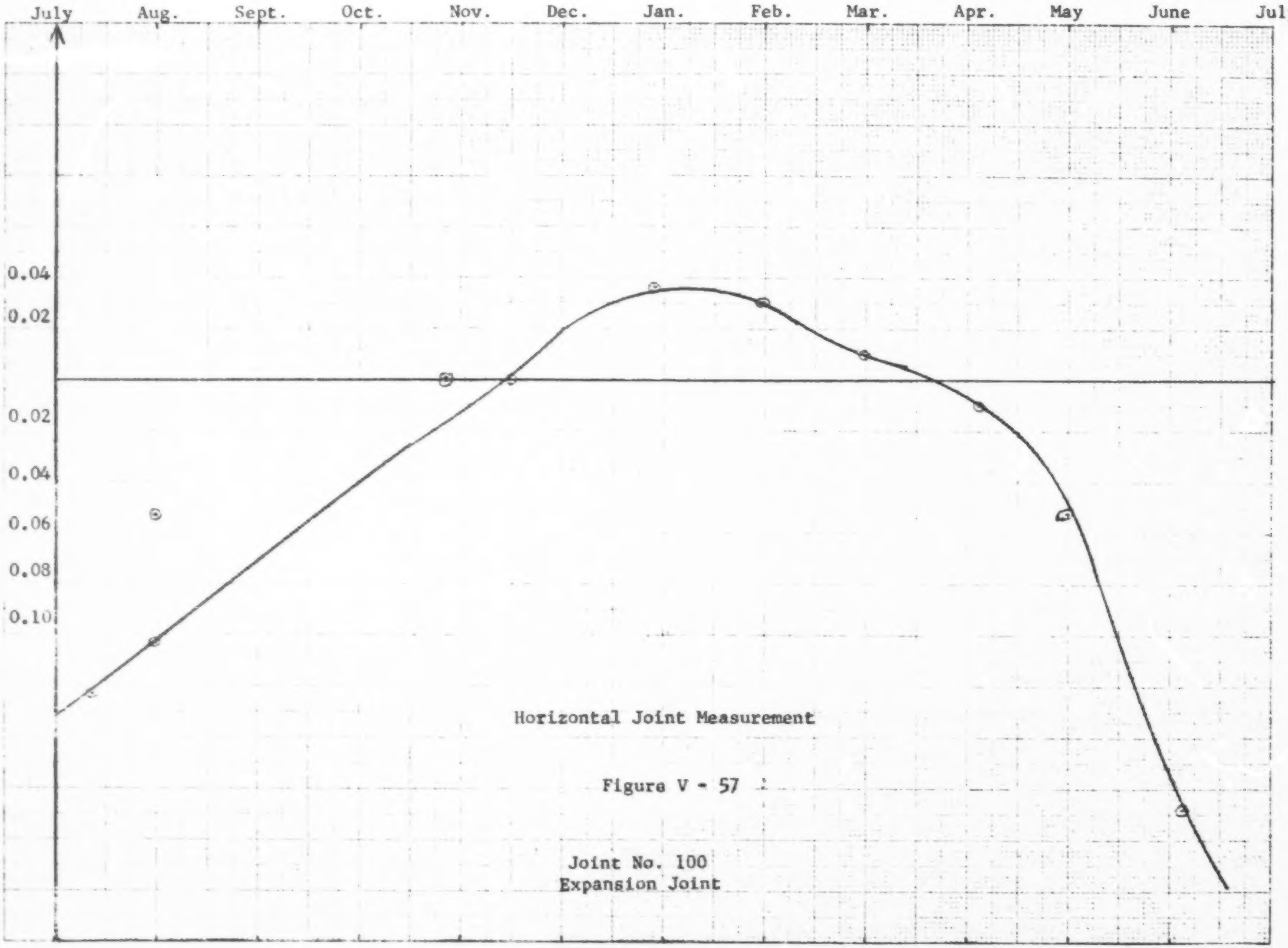


Figure V - 55

Horizontal Joint Measurement



Horizontal Joint Measurement

Figure V - 57

Joint No. 100
Expansion Joint

K-E
46 1320

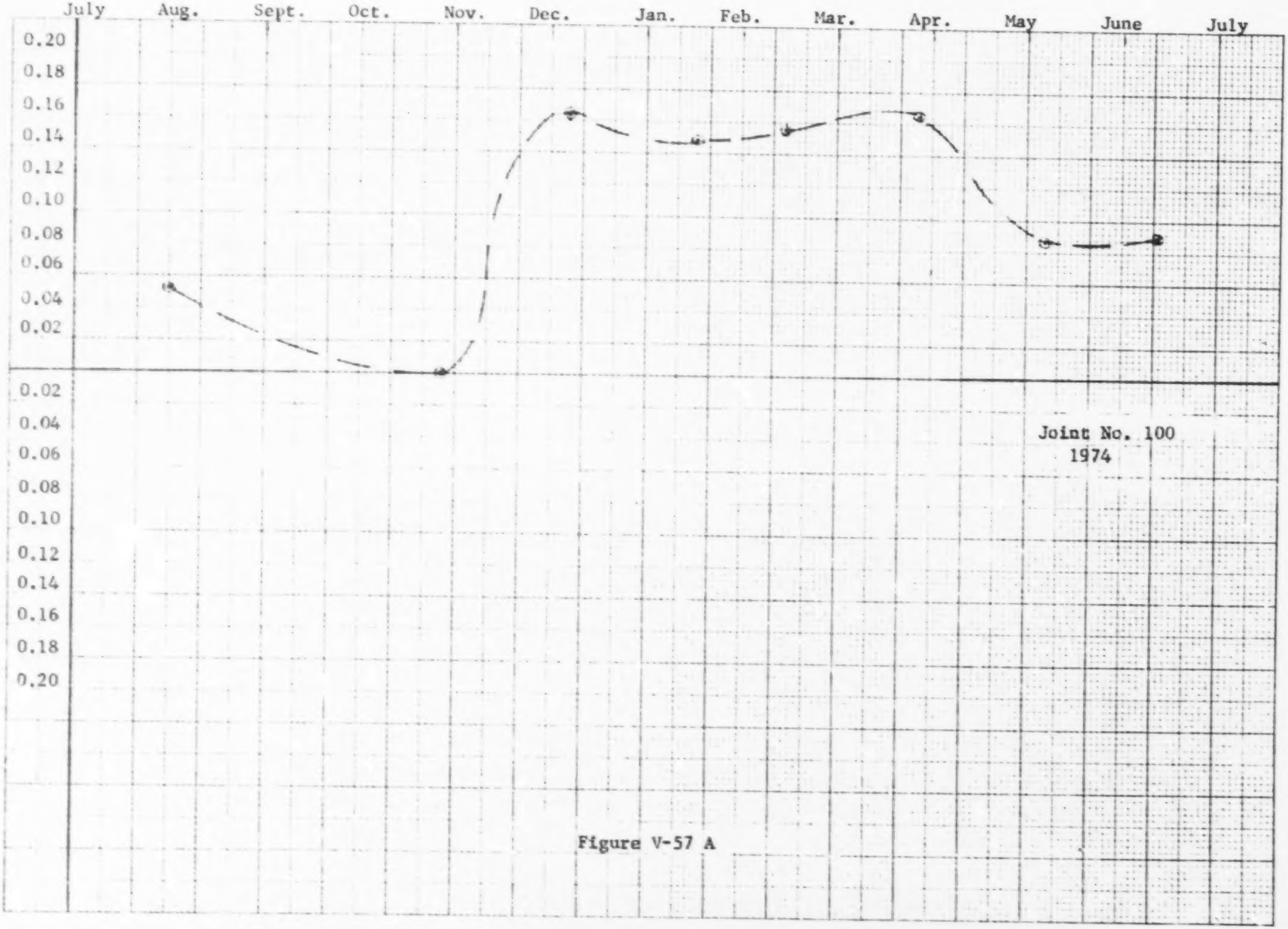


Figure V-57 A

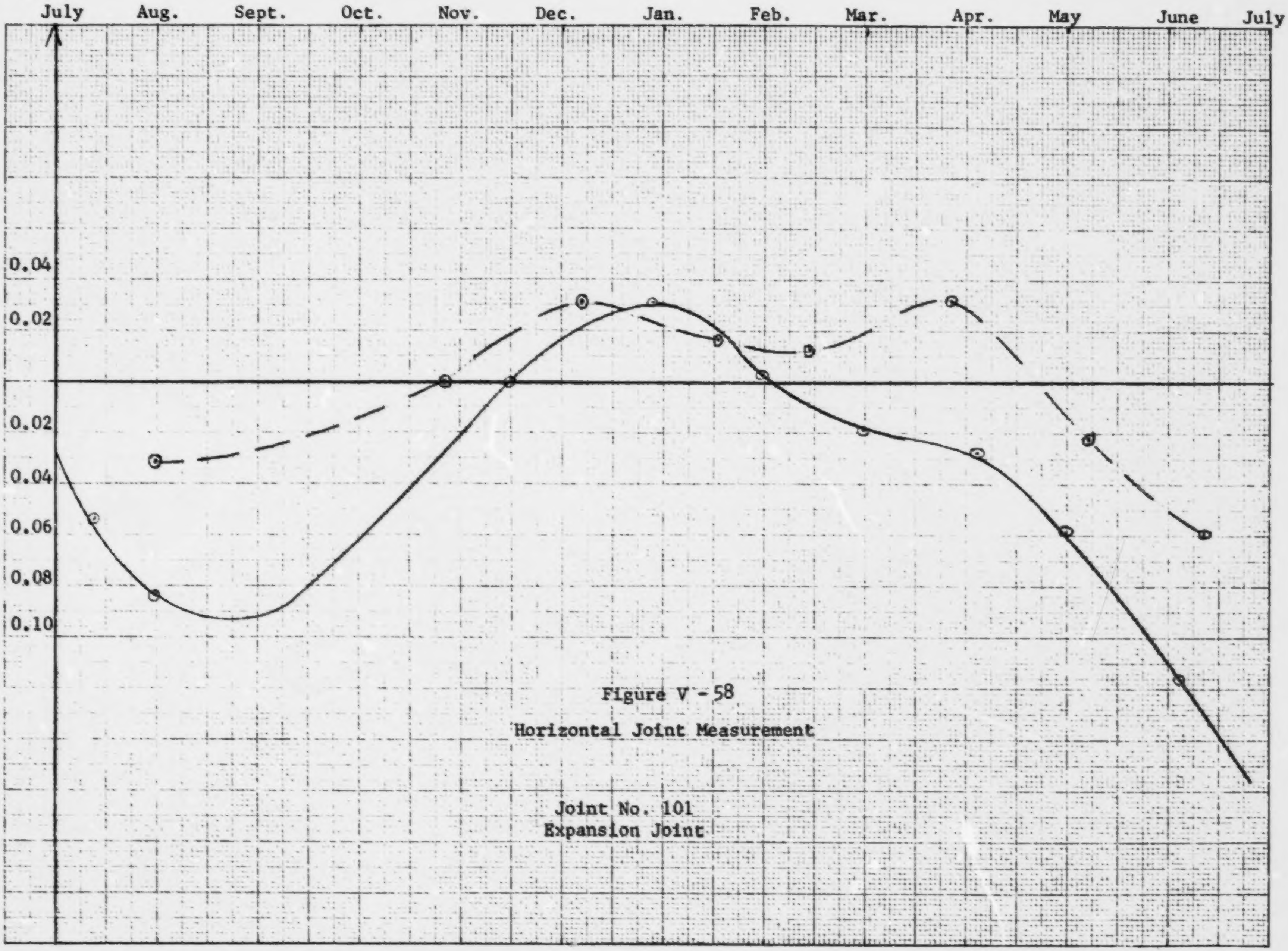


Figure V - 58

Horizontal Joint Measurement

Joint No. 101
Expansion Joint

FIELD TEMPERATURE MEASUREMENTS

Date	Location Joint No.	Pavement Temperature	Air Temperature
Nov. 1, 1973	1	38	36
Dec. 6, 1973	8	29	32
Dec. 20	16	36	39
Jan. 11, 1974	25	24	30
Jan. 17	38	48	49
Jan. 24	47	33	34
Jan. 31	56	50	54
Feb. 7	64	18	28
Feb. 14	76	43	39
Feb. 28 a.m.	85	40	44
Feb. 28 p.m.		35	40
March 7 a.m.	29	45	59
March 7 p.m.		71	66
March 14 a.m.	69	20	20
March 14 p.m.		50	34
April 25	1	No Temp. Recorded	
April 30	10	Broken Thermometer	
May 7	19		
May 14	27		
May 21	37		
May 28	47		
June 6	56	83	66
June 11	65	80	70
June 18	76	65	63
June 25 a.m.	4	73	65
June 25 p.m.	49	88	74
July 1 a.m.	59	70	77
July 1 p.m.		92	84
Sept. 25	76	86	64
Oct. 8	89	54	60

Mid Slab Temperature
1974

Date		Joint	6 a.m.	Noon	6 p.m.	Mid	Max	Min
April	24	4	-	-	-	-	-	-
	25	4	-	64	73	64	73	64
	26	4	64	75	85	76	85	64
	27	4	79	88	94	88	94	79
	28	4	79	90	93	90	93	79
	29	4	88	91	100	91	100	88
	30	12	85	75	75	82	85	75
May	1	12	75	76	82	70	82	70
	2	12	60	63	67	66	67	60
	3	12	61	75	67	63	75	61
	4	12	56	70	82	67	82	56
	5	12	60	73	75	67	75	60
	6	12	63	66	67	60	67	60
	7	21	64	76	90	75	90	64
	8	21	67	72	67	67	72	67
	9	21	63	63	67	61	67	61
	10	21	60	61	97	94	97	60
	11	21	75	79	99	90	99	75
	12	21	82	76	85	75	85	75
	13	21	73	76	90	82	90	73
	14	29	75	93	103	91	103	75
	15	29	87	87	91	88	91	87
	16	29	85	88	103	94	103	85
	17	29	90	94	103	90	103	90
	18	29	91	85	96	90	96	85
	19	29	82	84	96	90	96	82
	20	29	80	88	103	96	103	80
	21	39	90	96	106	97	106	90
	22	39	93	93	93	-	93	93
	23	39	80	88	97	94	97	80
	24	39	94	93	112	97	112	93
	25	39	76	75	80	73	80	73
	26	39	73	72	82	73	82	72
	27	39	66	75	84	78	84	66
	28	49	81	-	-	88	88	81
	29	49	97	87	-	-	97	87
	30	49	96	82	97	90	97	82
	31	49	90	97	-	-	97	90
June	1	49	106	97	112	140	140	97
	2	49	-	-	140	140	140	140
	3	49	82	88	97	94	97	82
	4	59	91	82	94	81	94	81
	5	59	73	85	90	82	90	73
	6	59	78	76	90	82	90	76
	7	59	75	82	95	85	95	75

cont'd

Date		Joint	6 a.m.	Noon	6 p.m.	Mid	Max	Min
June	8	59	80	84	91	84	91	80
	9	59	80	88	93	88	93	80
	10	59	82	88	93	85	93	82
	11	69	76	-	-	-	-	-
	12	69						
	13	69						
	14	69						
	15	69						
	16	69						
	17	69						
	18	78		75	84	75	84	75
	19	78	80	91	93	87	93	80
	20	78	82	98	105	94	105	82
	21	78	88	94	97	93	97	88
	22	78	88	88	-	-	88	88
	23		Recorder Not Working Due To Flooding					
	24							
	25							

Section 1

Joints 1 to 6

Air Temp. = -
Pvt. Temp. = -

Recorder	Joint	Zero Setting	
#1	1 & 2	L = 0.455	R = 0.065
#2	3	L = 0.315	R =
#3	4 & T	L = 0.395	R =
#4	5 & 6	L = 0.210	R = 0.340

40' spacing, standard dowels, granular base/8" bevel saw cut

DATE	JOINT #	MOVEMENT OF PAVEMENT 6 A.M.	NOON	6 P.M.	MID.
4/25/74	1	-	0.0	0.0	0.0
4/26		-.005	0.0	0.0	+.010
4/27		0.0	+.010	+.010	+.010
4/28		0.0	0.0	0.0	0.0
4/29		+.010	+.045	+.045	+.045
4/30		+.045			
4/25	2	-	0.0	+.025	+.045
4/26		+.045	+.025	+.020	+.030
4/27		+.045	+.025	+.020	+.025
4/28		+.025	+.010	+.010	+.025
4/29		+.030	+.025	+.025	+.025
4/30		+.030			
4/25	3	-	+.030	+.060	-.010
4/26		0.0			
4/27					
4/28					
4/29					
4/30					
4/25	4	-	-.015	0.0	-.025
4/26		-.035	+.010	+.100	0.0
4/27		0.0	+.025	+.110	+.010
4/28		-.010	+.025	+.115	+.065
4/29		0.0	+.065	+.115	+.100
4/30		+.020			
4/25	5	-	0.0	+.005	+.005
4/26		+.005	+.005	+.005	+.005
4/27		0.0	+.005	+.005	+.005
4/28		+.005	+.005	+.005	+.005
4/29		+.005	+.005	+.005	+.005
4/30		+.005			
4/25	6	-	0.0	+.060	+.060
4/26		+.060	+.060	+.110	+.060
4/27		+.060	+.060	+.085	+.085
4/28		+.060	+.085	+.110	+.085
4/29		+.060	+.110	+.110	+.110
4/30		+.085			

Section 2

Joints 10 to 15

Air Temp. = -
Pvt. Temp. = -

Recorder	Joint	Zero Setting	
#2	10 & 11	L = 0.090	R = 0.145
#3	12 & T	L = 0.470	R =
#1	13	L = 0.265	R =
#4	14 & 15	L = 0.320	R = 0.255

40' spacing, standard dowels, granular base, chlorinated rubber base cure

DATE	JOINT #	MOVEMENT OF PAVEMENT 6 A.M.	NOON	6 P.M.	MID.
4/30/74	10	-	+.030	+.245	+.170
5/1		+.185	+.215	+.205	+.225
5/2		+.225	+.225	0.0	-.010
5/3		+.100	+.185	+.185	+.205
5/4		+.225	+.225	+.245	+.255
5/5		+.255	+.255	+.265	+.255
5/6		+.245	+.255	+.245	+.255
5/7		+.245			
4/30	11	-	+.155	-	+.285
5/1		-	-	-	-
5/2		-	-	-.070	-.080
5/3		-.085	-.020	0.0	+.050
5/4		+.155	+.155	+.155	-
5/5		-	-	-	-
5/6		-	-	-	-
5/7		-			
4/30	12	-	0.0	+.025	-.245
5/1		-.245	-.160	-.100	-.050
5/2		-.010	-.010	-.295	-.090
5/3		-.075	-.195	-.010	-.015
5/4		-.020	-.010	-.010	-.010
5/5		-.035	-.015	-.015	-.015
5/6		-.020	-.020	-.015	-.020
5/7		-.035			
4/30	13	-	0.0	+.185	-.110
5/1		-.030	-.030	+.005	+.015
5/2		+.015	+.015	-.095	-.175
5/3		-.095	+.005	+.030	+.015
5/4		+.005	+.030	+.050	+.030
5/5		+.015	+.050	+.050	+.050
5/6		+.030	+.050	+.050	+.030
5/7		+.015			
4/30	14	-	0.0	-.105	-.200
5/1		-.160	-.105	0.0	+.010
5/2		0.0	-.035	-.260	-.255
5/3		-.160	-.145	-.035	-.060
5/4		-.060	-.060	-.035	-.035
5/5		-.080	-.060	-.035	-.035
5/6		-.060	-.035	-.035	-.060
5/7		-.060			
4/30	15	-	0.0	0.0	-.080
5/1		-.055	-.030	+.015	-.010
5/2		-.020	-.020	-.055	-.160
5/3		-.055	-.030	-.020	-.030
5/4		-.045	-.020	-.020	-.020
5/5		-.045	-.020	-.020	-.020
5/6		-.030	-.020	-.020	-.030
5/7		-.055			

Section 3

Joints 19 to 24

Air Temp. = -
Pvt. Temp. = -

Recorder	Joint	Zero Setting	
#2	19 & 20	L = 0.170	R = 0.300
#3	21 & T	L = 0.375	R =
#1	22	L = 0.435	R =
#4	23 & 24	L = 0.350	R = 0.010

21' spacing, standard dowels, stabilized base

	JOINT	MOVEMENT OF PAVEMENT			
DATE	#	6 A.M.	NOON	6 P.M.	MID.
5/7/74	19	-	+.020	+.040	+.040
5/8		+.020	+.040	-.010	-.080
5/9		+.020	+.030	+.030	+.040
5/10		+.040	+.045	+.045	+.045
5/11		+.040	+.040	+.040	+.040
5/12		-.100	-.060	+.045	+.030
5/13		+.040	+.040	+.045	+.040
5/14		+.040			
5/7	20	-	0.0	-.040	-.060
5/8		-.050	-.060	-.245	-.235
5/9		-.115	-.160	-.165	-.155
5/10		-.115	-.105	-.050	-.050
5/11		-.050	-.050	-.105	-.115
5/12		-.240	-.240	-.235	-.175
5/13		-.070	-.050	-.050	-.025
5/14		0.0			
5/7	21	-	+.120	+.135	+.135
5/8		+.135	+.135	+.118	+.070
5/9		+.095	+.105	+.130	+.128
5/10		+.130	+.135	+.135	+.135
5/11		+.135	+.135	+.135	+.135
5/12		-.085	-.210	+.120	+.130
5/13		+.005	+.085	+.135	+.135
5/14		+.135			
5/7	22	-	0.0	0.0	0.0
5/8		0.0	0.0	-.065	-.120
5/9		-.080	-.065	-.035	0.0
5/10		0.0	0.0	0.0	0.0
5/11		0.0	0.0	0.0	-.325
5/12		-.335	-.300	0.0	0.0
5/13		0.0	+.030	+.030	+.030
5/14		0.0	-	-	
5/7	23	-	+.050	+.050	+.025
5/8		-.015	-.015	-.295	-.295
5/9		-.175	-.165	-.140	-.130
5/10		-.125	-.130	-.090	-.090
5/11		-.090	-.090	-.015	-.295
5/12		-.295	-.295	-.130	-.130
5/13		-.245	-.265	-.245	-.265
5/14		-.265			
5/7	24	-	+.015	+.035	+.015
5/8		0.0	+.005	+.015	+.005
5/9		0.0	+.005	+.015	0.0
5/10		0.0	+.025	+.045	+.015
5/11		0.0	+.050	+.050	+.035
5/12		+.025	+.035	+.045	+.015
5/13		0.0	+.050	+.045	+.025
5/14		+.015			

Section 4

Joints 27 to 32

Air Temp. = -
Pvt. Temp. = -

Recorder	Joint	Zero Setting	
#2	27 & 28	L = 0.260	R = 0.060
#3	29 & T	L = 0.210	R =
#1	30	L =	R =
#4	31 & 32	L = 0.260	R = 0.270

40' spacing, standard dowels, stabilized base

	JOINT	MOVEMENT OF PAVEMENT			
DATE	#	6 A.M.	NOON	6 P.M.	MID.
5/14/74	27	-	+.035	+.055	+.035
5/15		+.015	-.070	-.025	-.015
5/16		-.025	-.025	0.0	0.0
5/17		-.010	0.0	+.015	-.090
5/18		-.190	-.015	0.0	0.0
5/19		-.025	-.015	-.010	-.015
5/20		-.025	-.015	0.0	0.0
5/21		-.015			
5/14	28	-	+.315	-	-
5/15		-	+.075	+.135	+.290
5/16		-	-	-	-
5/17		-	-	-	+.125
5/18		0.0	+.215	+.370	-
5/19		-	-	-	-
5/20		-	-	-	-
5/21		-			
5/14	29	-	+.080	+.100	+.090
5/15		+.080	-.035	-.020	+.045
5/16		+.045	+.020	+.060	+.070
5/17		+.045	+.060	+.060	-.120
5/18		+.125	+.045	+.080	+.080
5/19		+.060	+.060	+.070	+.090
5/20		+.070	+.070	+.090	+.090
5/21		+.085			
5/14	30				
5/15					
5/16		NO RESULTS			
5/17					
5/18					
5/19					
5/20					
5/21					
5/14	31	-	+.070	+.055	+.070
5/15		+.070	-.215	-.220	-.110
5/16		-.100	-.075	-.185	-.175
5/17		-.160	-.175	-.165	-.210
5/18		-.205	-.215	-.220	-.220
5/19		-.165	-.120	-.155	-.120
5/20		-.175	-.180	-.205	-.205
5/21		-.140			
5/14	32	-	+.030	+.030	+.055
5/15		+.055	-.210	-.210	-.035
5/16		-.035	-.025	+.030	+.055
5/17		+.055	+.055	+.110	-.195
5/18		-.195	-.210	-.210	-.210
5/19		-.095	-.035	-.060	-.035
5/20		-.035	-.035	-.060	-.035
5/21		0.0			

Section 5

Air Temp. = -
Pvt. Temp. = -

Joints 37 to 42

Recorder	Joint	Zero Setting	
#2	37 & 38	L = 0.200	R = 0.150
#3	39 & T	L = 0.285	R =
#1	40	L = 0.155	R =
#4	41 & 42	L = 0.140	R = 0.200

17' spacing, skew, plain pavement, no dowels

DATE	JOINT #	MOVEMENT OF PAVEMENT 6 A.M.	NOON	6 P.M.	MID.
5/21/74	37	-	+.115	+.115	+.105
5/22		+.095	+.095	+.105	-.130
5/23		-.110	-.080	-.030	+.075
5/24		-.120	+.015	+.035	+.115
5/25		+.115	+.115	+.115	+.115
5/26		+.115	+.115	+.115	+.125
5/27		+.125	+.125	+.135	+.125
5/28		+.115	-	-	-
5/21	38	-	-	-	-
5/22		-	-	-	-.070
5/23		-.025	+.010	+.180	-
5/24		-.005	+.180	-	-
5/25		-	-	-	-
5/26		-	-	-	-
5/27		-	-	-	-
5/28		-			
5/21	39	-	0.0	0.0	0.0
5/22		0.0	0.0	0.0	-.240
5/23		-.220	-.220	-.195	-.115
5/24		-.075	-.075	0.0	0.0
5/25		0.0	0.0	0.0	0.0
5/26		0.0	0.0	0.0	0.0
5/27		-.075	-.025	0.0	-.040
5/28		-.025	-	-	
5/21	40	-	+.020	+.025	+.020
5/22		+.015	+.020	+.015	-.075
5/23		-.110	-.120	+.020	+.020
5/24		-.045	+.025	+.025	+.015
5/25		+.010	+.025	+.030	+.030
5/26		+.010	+.010	+.025	+.015
5/27		+.010	+.030	+.025	+.020
5/28		+.010			
5/21	41	-	+.020	-.020	+.175
5/22		-.005	-.035	-.070	-.100
5/23		-.055	-.055	-.020	+.020
5/24		0.0	0.0	+.020	-.030
5/25		-.055	-.035	-.045	-.035
5/26		-.030	-.035	-.035	-.020
5/27		0.0	0.0	+.010	+.015
5/28		+.015			
5/21	42	-	+.010	+.035	+.035
5/22		+.025	-.030	+.025	-.125
5/23		-.040	-.035	0.0	0.0
5/24		-.025	-.020	0.0	0.0
5/25		+.010	+.025	+.025	+.025
5/26		+.025	+.020	+.025	+.025
5/27		+.035	+.035	+.035	+.025
5/28		+.025	-	-	-

Section 6

Air Temp. = -
Pvt. Temp. = -

Joints 47 to 52

Recorder	Joint	Zero Setting	
#2	47 & 48	L = 0.260	R = 0.145
#3	49 & T	L = 0.090	R =
#1	50	L =	R = 0.065
#4	51 & 52	L = 0.260	R = 0.235

21' spacing, plastic coated dowels, granular base

DATE	JOINT #	MOVEMENT OF PAVEMENT 6 A.M.	NOON	6 P.M.	MID.
5/28/74	47	-	0.0	+.015	-.015
5/29		-.015	+.015	-.195	-.030
5/30		-.030	-.015	0.0	+.015
5/31		-.190	-.190	-.160	-.045
6/1		-.030	-.030	-.035	-.030
6/2		-.035	-.035	+.015	+.015
6/3		-.080	-.060	-.030	-.015
6/4		-.070	-	-	-
5/28	48	-	0.0	-	+.030
5/29		+.095	+.030	-.085	+.030
5/30		+.055	+.065	+.105	+.130
5/31		+.010	-.090	-.060	-.020
6/1		-.020	-.020	-.020	-.060
6/2		-.045	+.025	+.130	+.280
6/3		-	-	+.280	-
6/4		-			
5/28	49	-	+.010	+.175	+.175
5/29		+.190	+.200	+.210	+.085
5/30		+.135	+.180	+.180	+.135
5/31		+.180	+.210	+.210	+.035
6/1		+.160	+.180	+.190	+.200
6/2		+.190	+.200	+.200	+.190
6/3		+.180	+.210	+.190	+.200
6/4		+.190			
5/28	50	-	0.0	+.145	+.145
5/29		+.135	+.135	-.010	+.045
5/30		+.075	+.025	+.105	+.105
5/31		-.020	-.010	-.020	+.075
6/1		+.090	+.105	+.105	+.145
6/2		+.145	+.145	+.180	+.150
6/3		+.145	+.180	+.180	+.150
6/4		+.150			
5/28	51	-	0.0	0.0	0.0
5/29		-.045	-.045	-.205	-.175
5/30		-.135	-.100	-.095	-.045
5/31		-.100	-.205	-.100	-.105
6/1		-.100	-.100	-.100	-.075
6/2		-.045	-.050	-.045	-.02
6/3		-.020	-.045	-.045	0.0
6/4		0.0	-	-	-
5/28	52	-	0.0	-.060	-.060
5/29		-.045	-.075	-.175	-.130
5/30		-.125	-.130	-.125	-.060
5/31		-.060	-.160	-.130	-.125
6/1		-.125	-.165	-.060	-.100
6/2		-.045	-.060	-.060	-.095
6/3		-.045	-.045	-.075	-.060
6/4		-.060			

Section 7 **Joints 56 to 61**

Air Temp. = 66°
Pvt. Temp. = 83°

Recorder	Joint	Zero Setting	
#2	56 & 57	L = 0.135	R = 0.100
#1	58	L = 0.245	R =
#3	59 & T	L = 0.360	R =
#4	60 & 61	L = 0.110	R = 0.190

40' spacing, plastic coated dowels, granular base

		MOVEMENT OF PAVEMENT			
DATE	JOINT #	6 A.M.	NOON	6 P M	MID.
6/4/74	56	-	+.035	+.125	+.170
6/5		+.200	+.220	+.220	+.220
6/6		+.220	+.200	+.220	-.020
6/7		0.0	-.010	-.025	-.025
6/8		+.025	-.020	-.065	-.020
6/9		-.025	-.055	-.065	-.025
6/10		+.035	+.105	+.220	+.245
6/11		+.220			
6/4	57	-	+.200		
6/5					
6/6					+.025
6/7		-.020	-.020	+.025	+.095
6/8				-.055	+.325
6/9			+.325		
6/10					
6/11					
6/4	58	-	0.0	+.030	+.030
6/5		+.030	+.030	+.030	+.030
6/6		+.030	0.0	-.190	+.040
6/7		-.045	-.035	-.035	0.0
6/8		0.0	0.0	-.200	-.075
6/9		-.045	-.035	-.035	-.035
6/10		-.035	-.030	+.030	+.030
6/11		0.0			
6/4	59	0.0	0.0	0.0	0.0
6/5		0.0	0.0	+.010	0.0
6/6		0.0	0.0	0.0	-.240
6/7		-.215	-.060	-.135	-.030
6/8		-.010	-.135	+.100	+.110
6/9		-.245	-.285	-.090	-.050
6/10		-.050	-.040	-.025	-.025
6/11		-.025			
6/4	60	-	+.050	+.080	+.020
6/5		-.005	-.025	-.025	-.020
6/6		-.025	-.030	-.025	-.025
6/7		-.02	-.050	-.055	-.035
6/8		-.04	-.015	-.040	-.055
6/9		-.015	-.025	-.040	-.060
6/10		-.040	-.050	-.050	-.040
6/11		-.040			
6/4	61	-	+.035	+.055	+.080
6/5		+.110	+.110	+.110	+.110
6/6		+.110	+.080	+.110	-.015
6/7		-.015	+.110	+.110	+.110
6/8		+.110	+.055	-.045	-.015
6/9		+.020	-.015	+.010	+.020
6/10		+.020	+.010	+.010	+.020
6/11		+.010			

Section 9 **Joints 74, 76, 77, 79, 80, 81**

Air Temp. = 63°
Pvt. Temp. = 65°

Recorder	Joint	Zero Setting	
#3	78 & T	L = 0.350	R =
#2	76 & 77	L = 0.190	R = 0.1425
#1	79	L = 0.345	R =
#4	80 & 81	L =	R =

40' spacing, standard dowels, granular base

		MOVEMENT OF PAVEMENT			
DATE	JOINT #	6 A.M.	NOON	6 P.M.	MID.
6/18/74	74	-	0.0	0.0	-.015
6/19		-.025	0.0	0.0	0.0
6/20		0.0	0.0	0.0	0.0
6/21		-.040	0.0	0.0	0.0
6/22		+.010	0.0		

Readings end due to flooding
on June 22, 1974

DATE	JOINT #	6 A.M.	NOON	6 P.M.	MID.
6/18	76	-	+.105	+.125	+.105
6/19		+.105	+.145	+.145	+.125
6/20		+.125	+.165	+.145	+.135
6/21		+.135	+.135	+.135	+.135
6/22		+.115	+.115		
6/18	77	-	-.0345	-.0825	-.0825
6/19		-.0675	-.1025	-.1075	-.1145
6/20		-.1145	-.1195	-.1245	-.1245
6/21		-.0925	-.1025	-.1245	-.1195
6/22		-.1075	-.1195		
6/18	79	-	0.0	+.015	+.015
6/19		0.0	+.015	+.015	+.015
6/20		+.015	+.030	+.030	+.030
6/21		+.030	+.030	+.030	+.030
6/22		+.030	+.030	-.030	-.175
6/23		-.135	-.135	-.135	-.135
6/24		-.015	-.160	-.100	-.070
6/25		-.035			
6/18	80	-	+.065	+.095	+.105
6/19		+.105	+.105	+.105	+.125
6/20		+.125	+.125	+.125	+.125
6/21		+.090	+.065	+.105	+.105
6/22		+.105	+.105		
6/18	81	-	+.055	+.065	+.255
6/19		+.055	+.030	+.355	+.255
6/20		+.080	+.355	+.355	+.355
6/21		+.045	+.030	+.080	+.090
6/22		+.030	+.090		

WEEKLY SLAB MOVEMENT CURVES

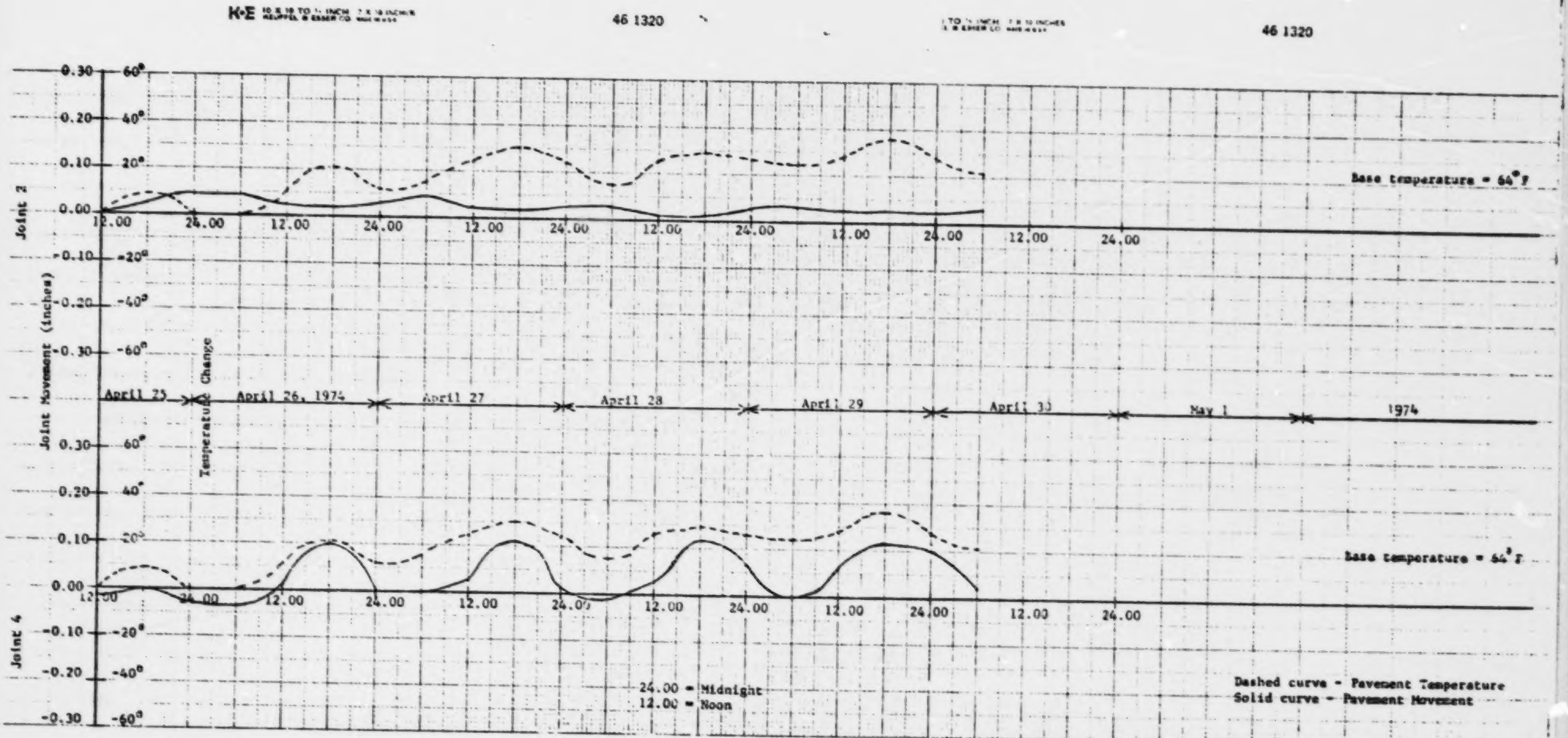


Figure V-39

WEEKLY SLAB MOVEMENT CURVES

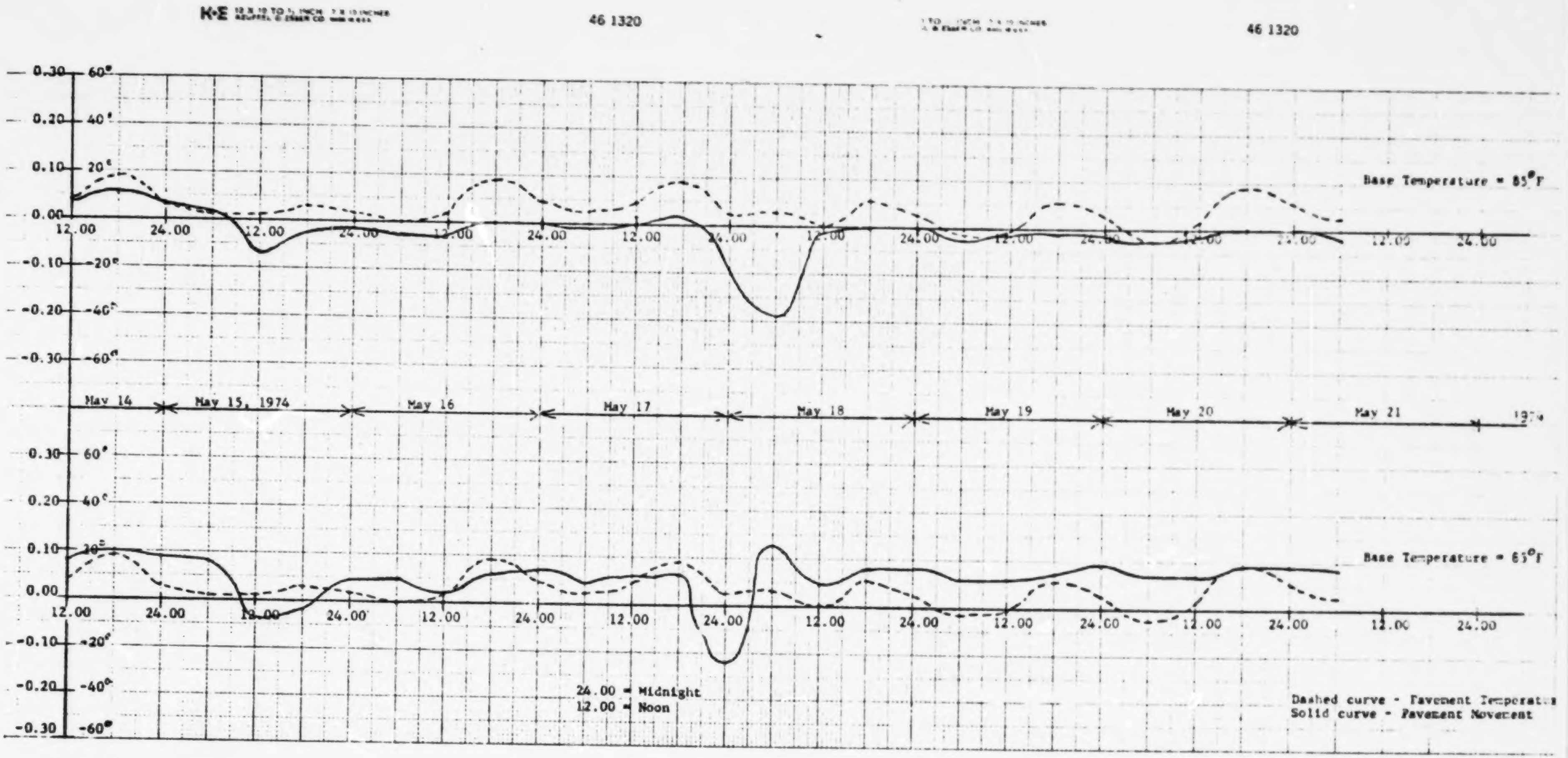


Figure V-60

WEEKLY SLAB MOVEMENT CURVES

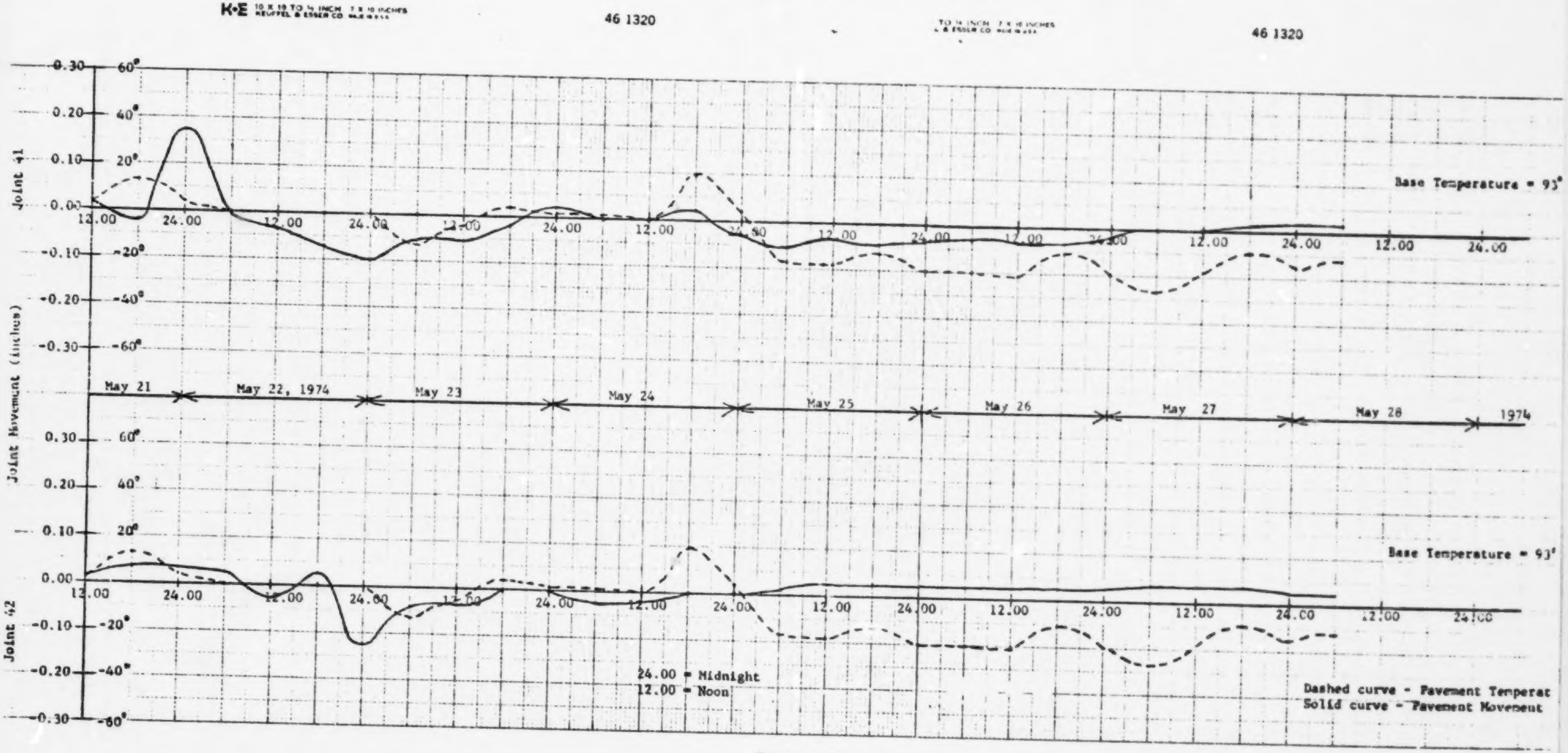


Figure V-61

WEEKLY SLAB MOVEMENT CURVES

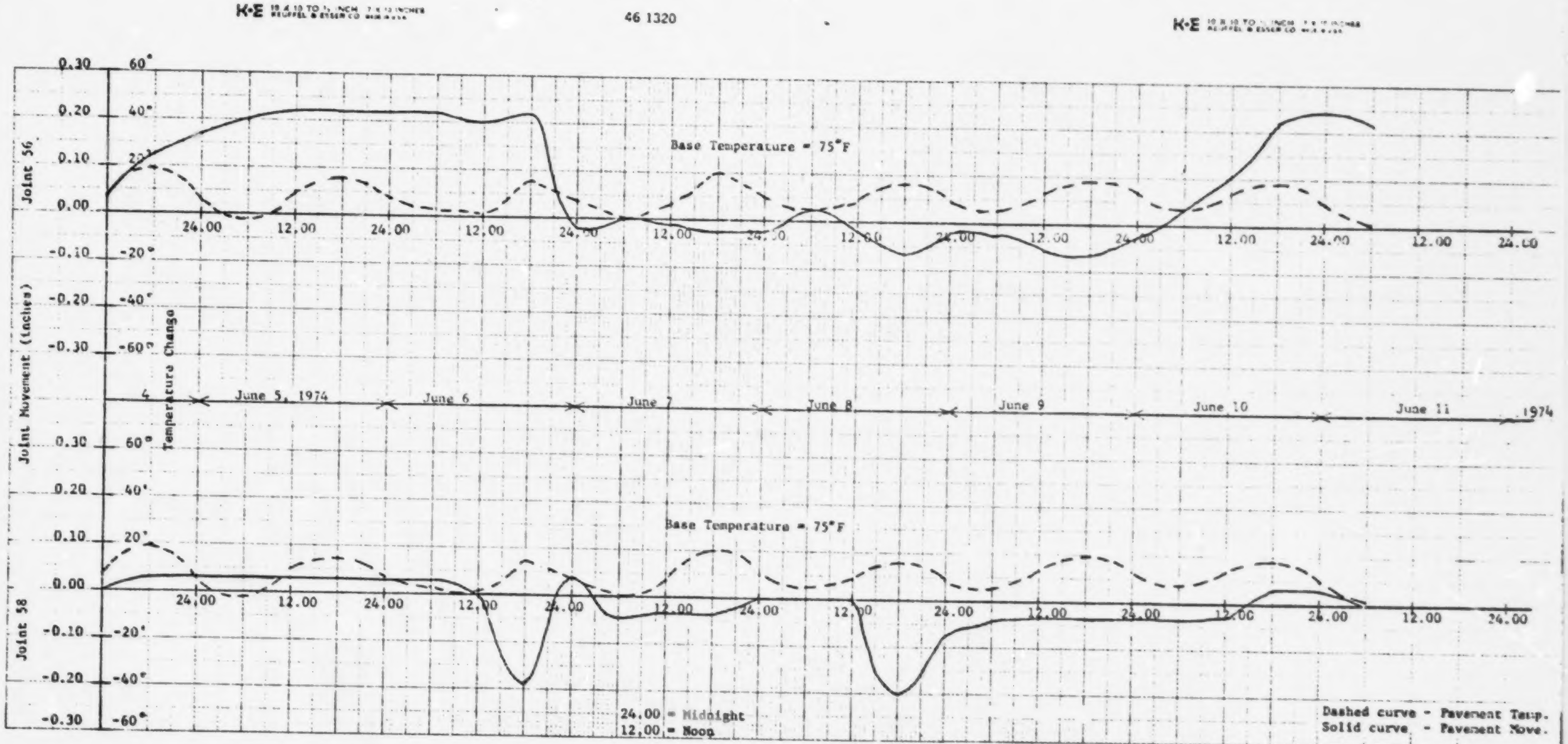


Figure V-63

WEEKLY SLAB MOVEMENT CURVES

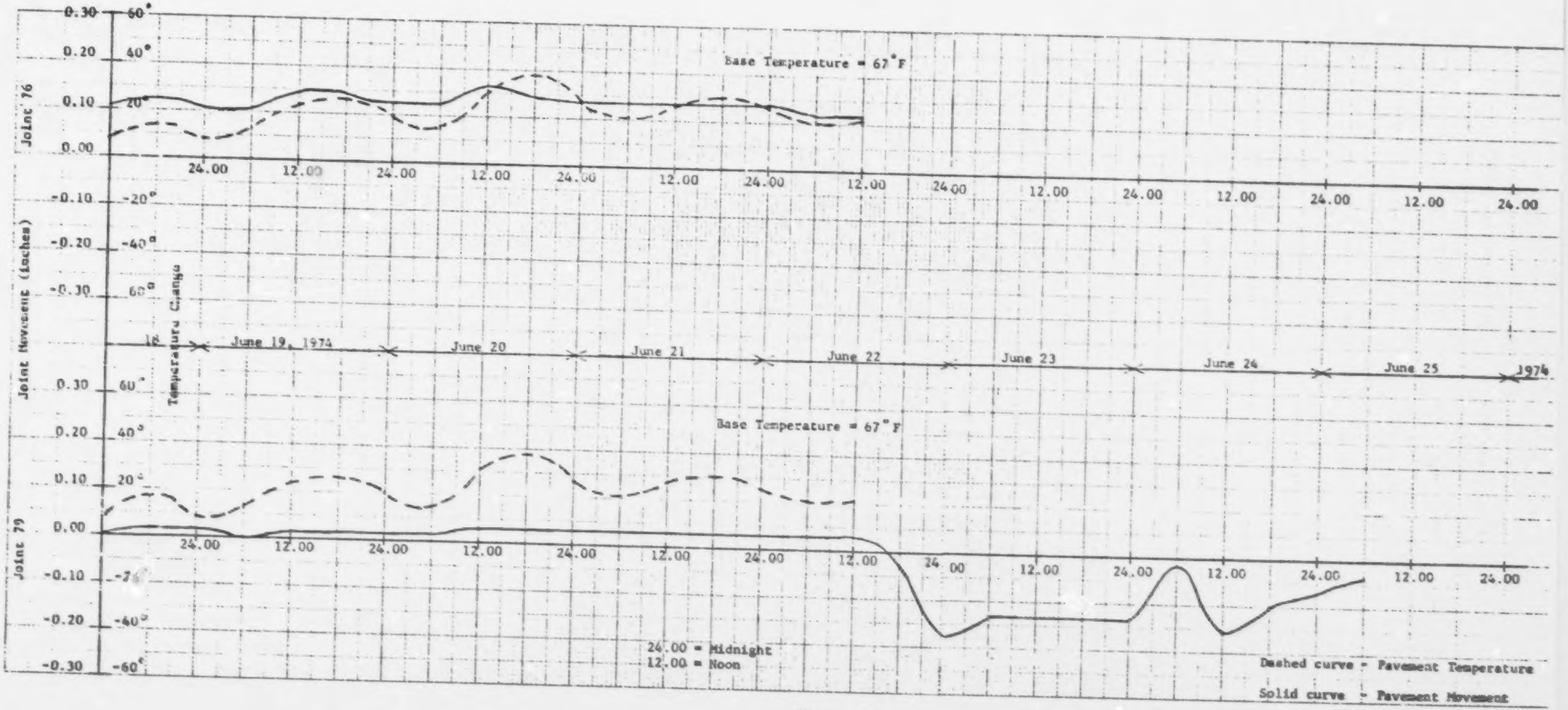


Figure V-64

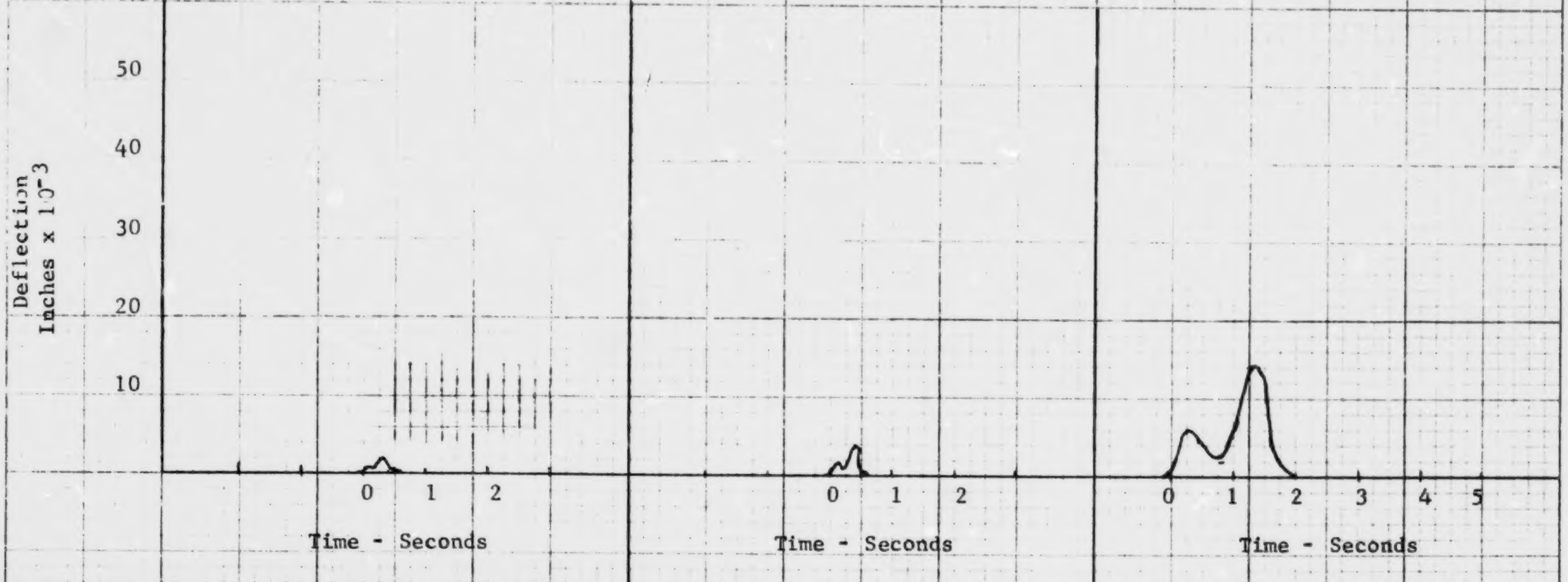
K&E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 0780

Vertical Pavement Deflection - Joint No. 40

Axle Load: Front 9700 lb. Rear - 17,850 lb.

Time 0800 Nov. 8, 1973

Air Temp - 32 F Pavement Surface Temp - 31 F



Truck in Center of Passing Lane - 55 mph

Truck at Edge of Passing Lane - 55 mph

Truck at Edge of Passing Lane - 10 mph

Figure V - 65

K+E 10 X 10 TO THE INCH 46 0780
7 X 10 INCHES MADE IN U.S.A.
KEUFFEL & ESSER CO.

Vertical Pavement Deflections - Joint No. 40

Axle Load: Front - 9700 lb. Rear - 17,850 lb.

Time - 1300 Nov. 8, 1973

Air Temp - 45 F Pavement Surface Temp - 55 F

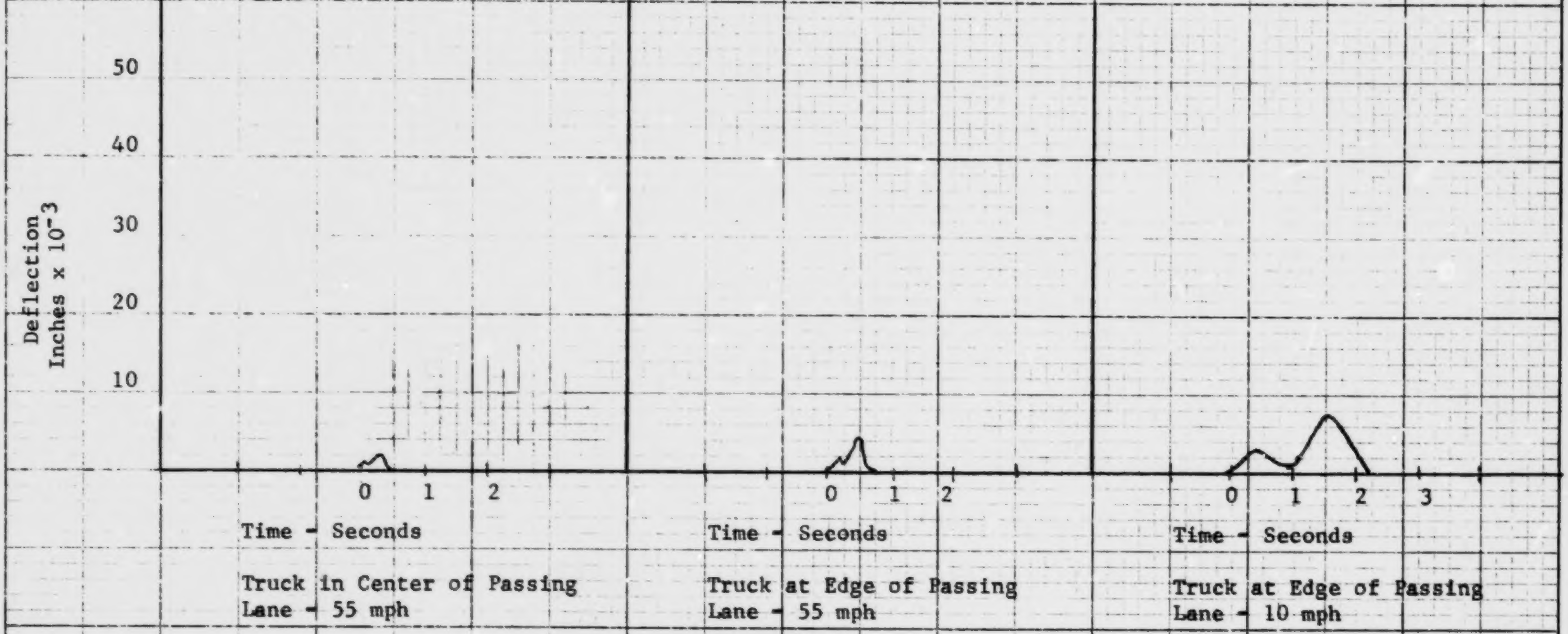


Figure V - 66

K+E 10 X 10 TO THE INCH 46 0780
7 X 10 INCHES MADE IN U.S.A.
KEUFFEL & ESSER CO.

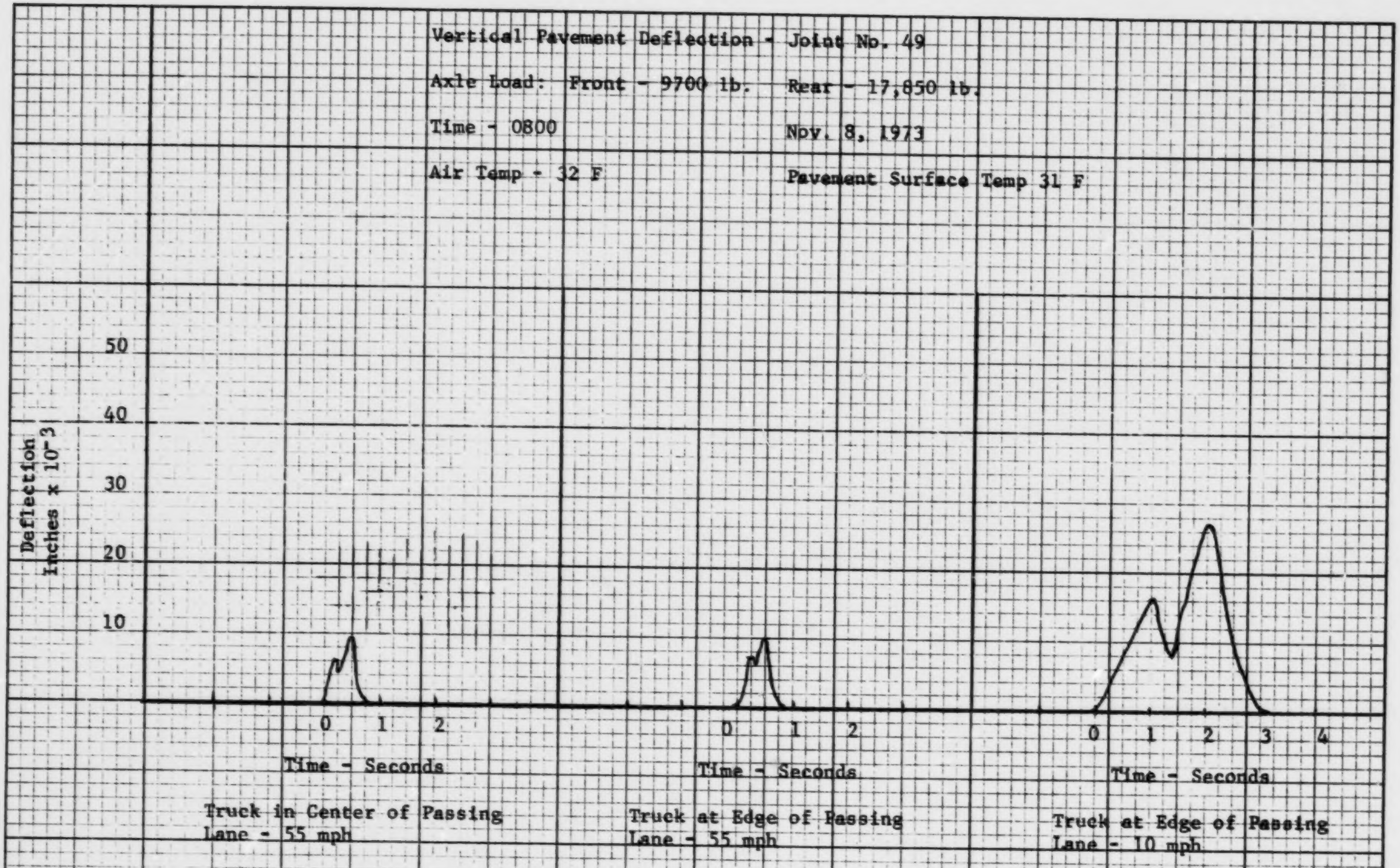


Figure V - 67

K+E 10 X 10 TO THE INCH 46 0780
7 X 10 INCHES MADE IN U.S.A.
KEUFFEL & ESSER CO.

Vertical Pavement Deflection - Joint No. 49

Axle Load: Front - 9700 lb. Rear - 17850 lb.

Time - 1300 Nov. 8, 1973

Air Temp - 45 F Pavement Surface Temp - 55 F

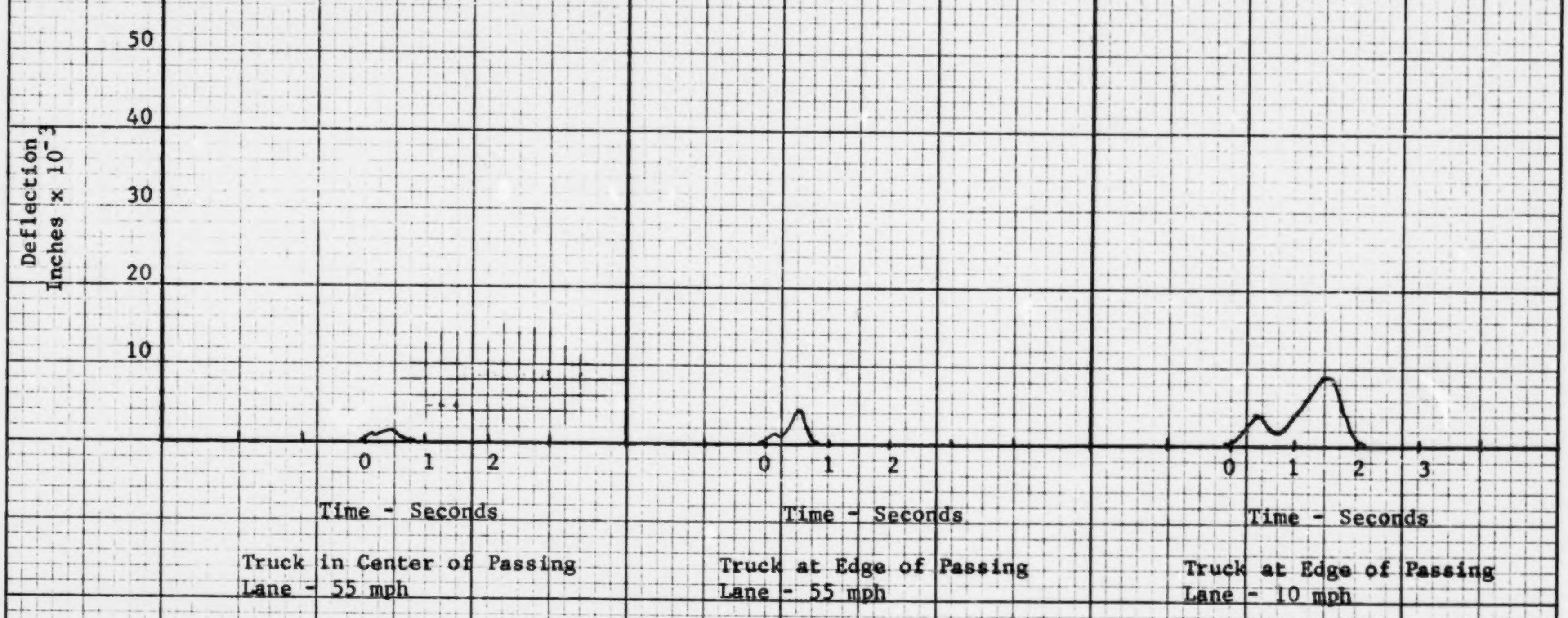


Figure V - 68

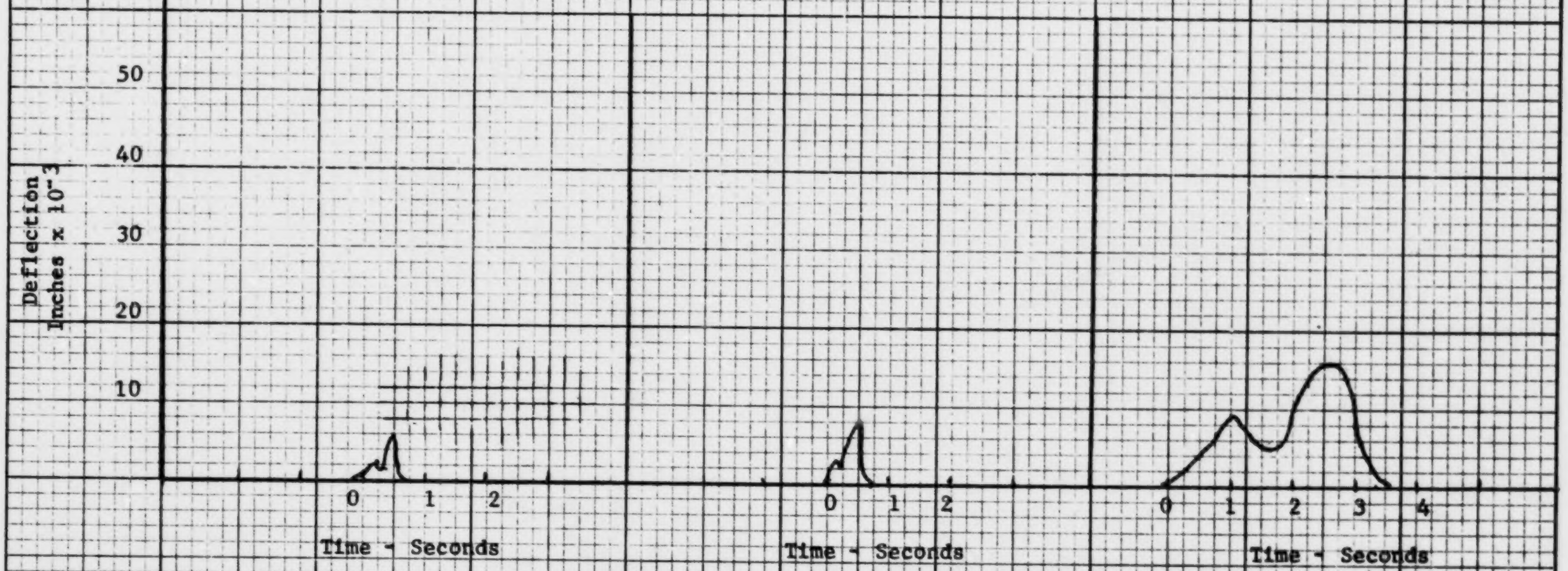
K+E 10 X 10 TO THE INCH 46 0780
7 X 10 INCHES MADE IN U.S.A.
KEUFFEL & ESSER CO.

Vertical Pavement Deflection - Joint No. 59

Axle Load: Front - 9700 lb. Rear - 17,850 lb.

Time - 0800 Nov. 8, 1973

Air Temp - 32 F Pavement Surface Temp - 31 F



Truck in Center of Passing Lane - 55 mph

Truck at Edge of Passing Lane - 55 mph

Truck at Edge of Passing Lane - 10 mph

Figure V - 69

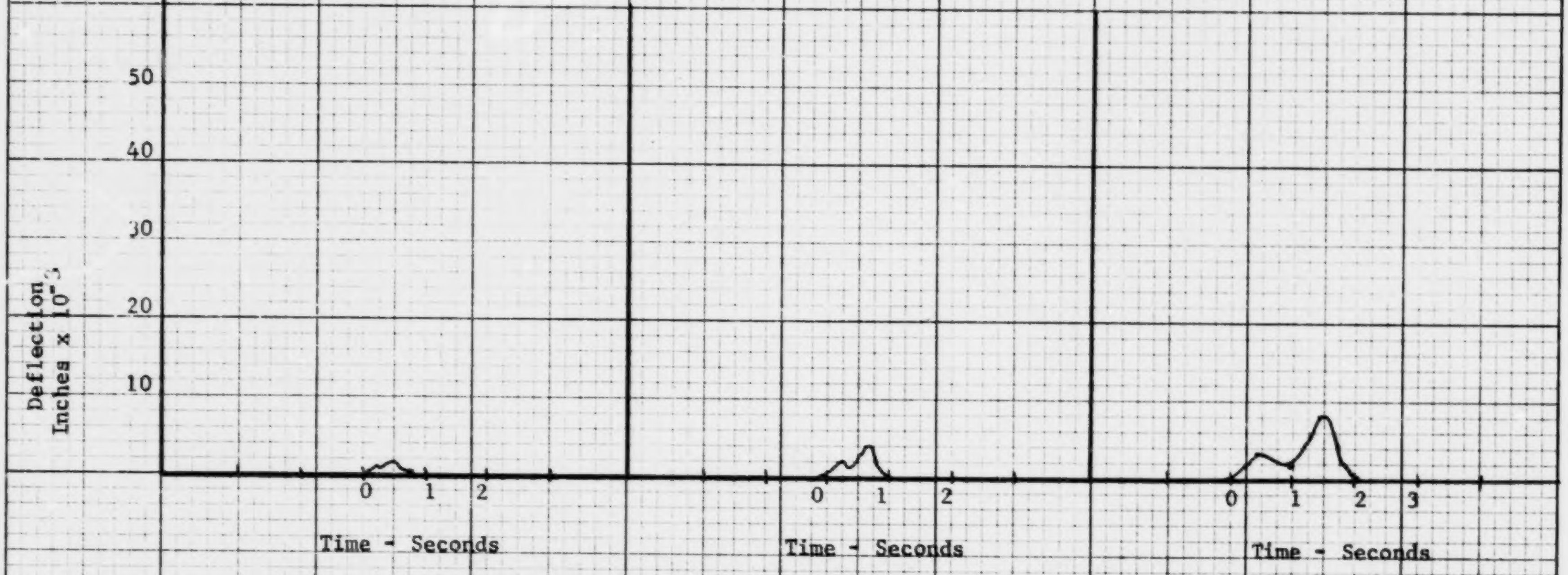
K+E 10 X 10 TO THE INCH 46 0780
7 X 10 INCHES MADE IN U.S.A.
KEUFFEL & ESSER CO.

Vertical Pavement Deflection - Joint No. 5.

Axle Load: Front - 9700 lb. Rear - 17,850 lb.

Time - 1300 Nov. 8, 1974

Air Temp - 45 F Pavement Surface Temp. - 55 F



Truck in Center of Passing Lane - 55 mph

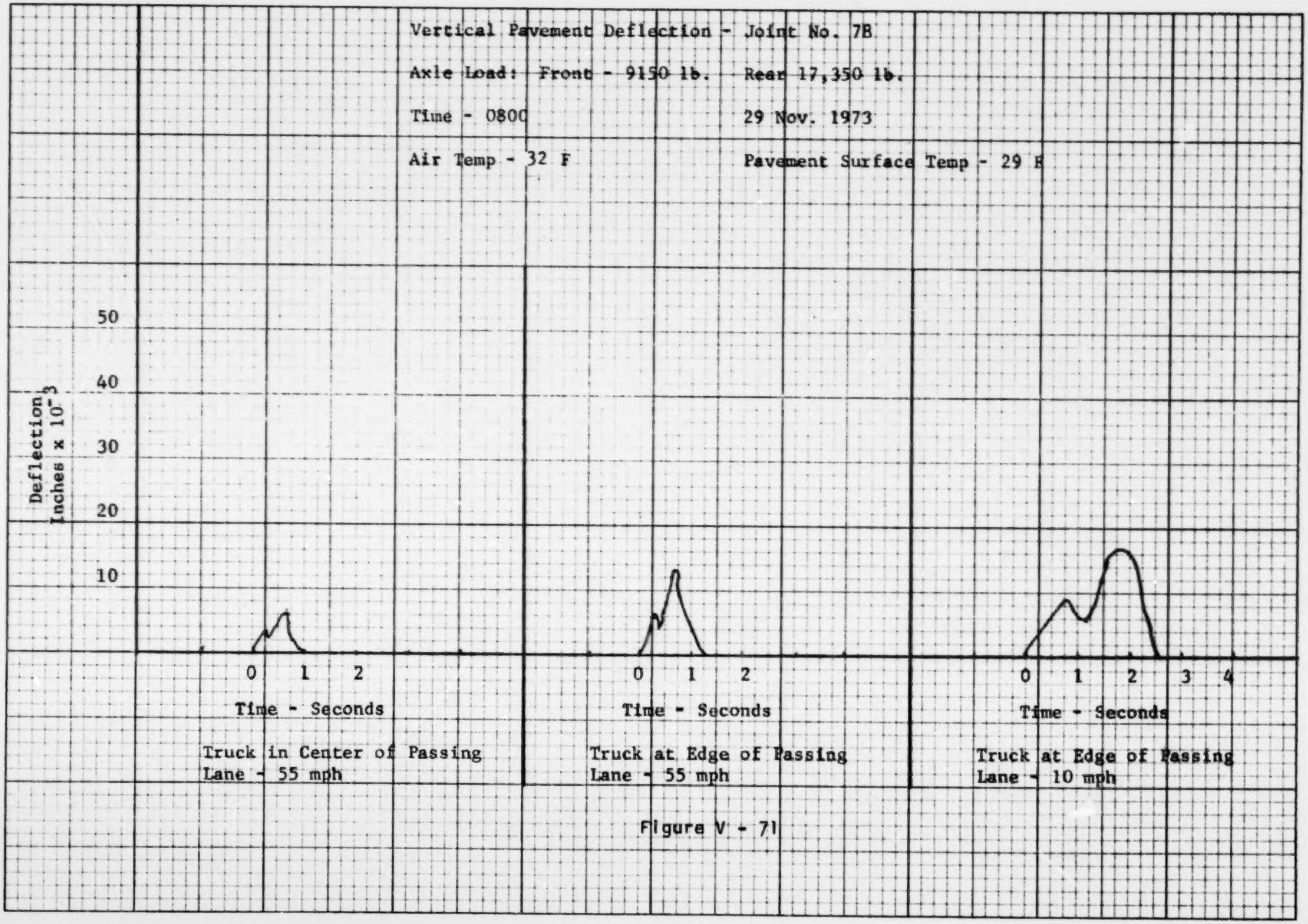
Truck at Edge of Passing Lane - 55 mph

Truck at Edge of Passing Lane - 10 mph

Figure V - 70

K•E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 0780



Vertical Pavement Deflection - Joint No. 7B

Axle Load: Front - 9150 lb. Rear 17,350 lb.

Time - 0800 29 Nov. 1973

Air Temp - 32 F Pavement Surface Temp - 29 F

Truck in Center of Passing Lane - 55 mph

Truck at Edge of Passing Lane - 55 mph

Truck at Edge of Passing Lane - 10 mph

Figure V - 71

K•E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 0780

Vertical Pavement Deflection - Joint No. 78

Axle Load: Front - 9150 lb. Rear - 17,350 lb.

Time - 1300

29 Nov. 1973

Air Temp - 38 F

Pavement Surface Temp - 38 F

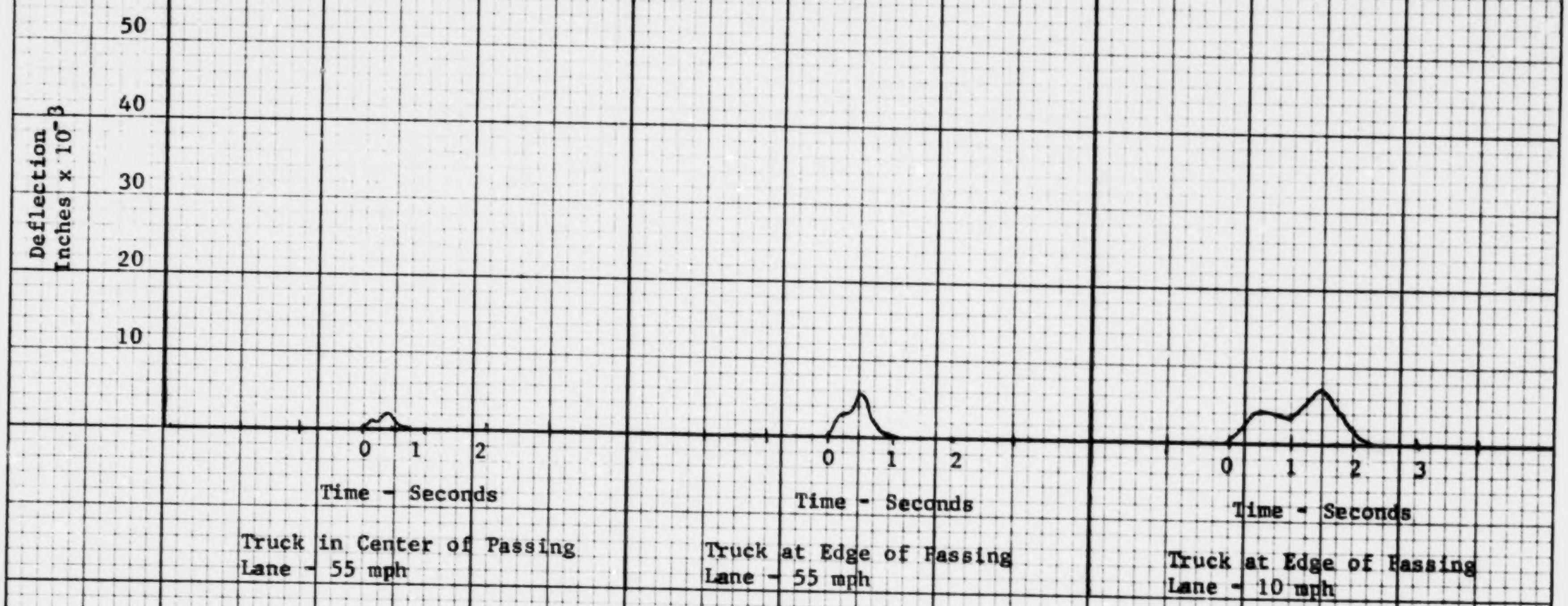
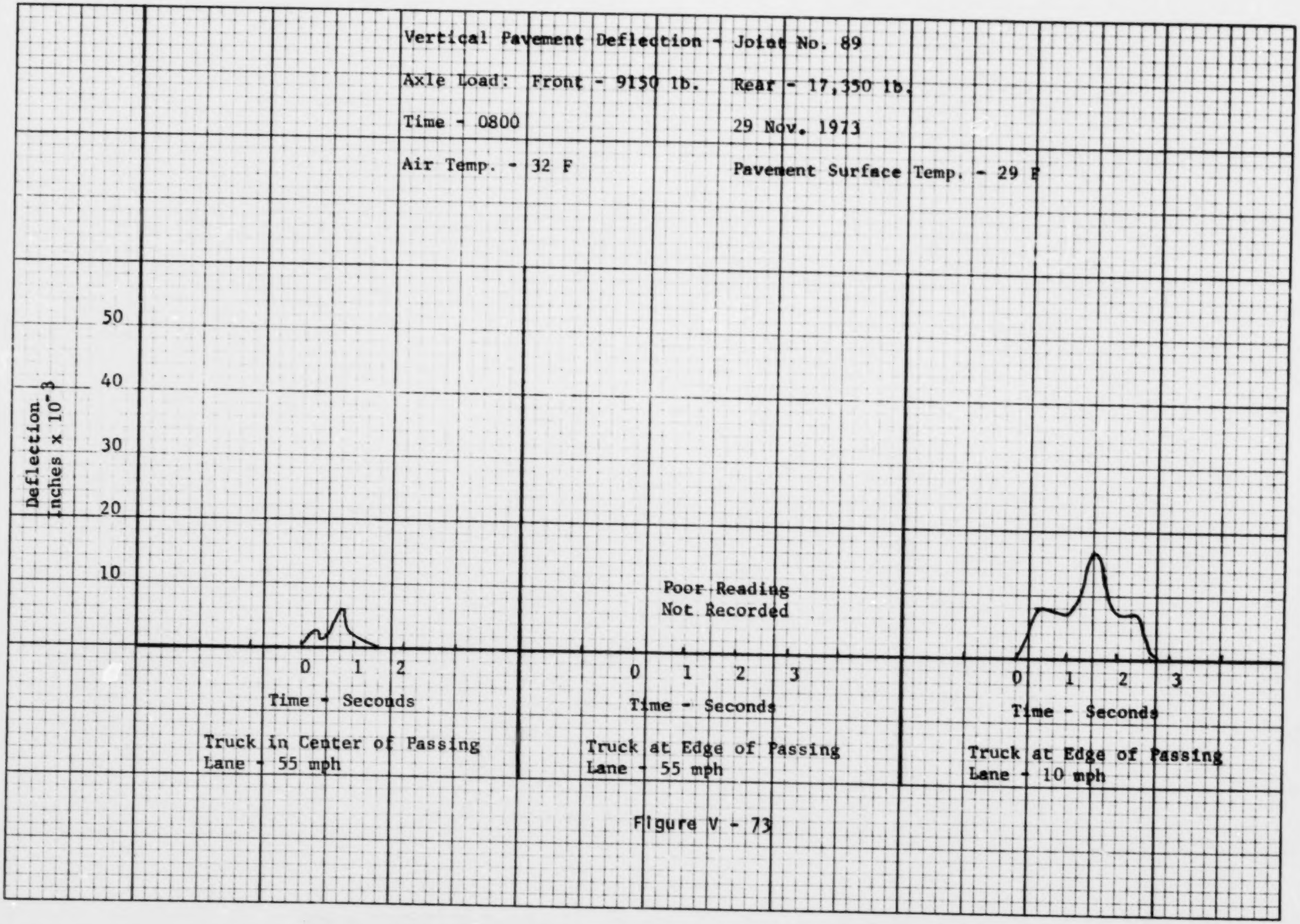


Figure V - 72

K•E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 0780


Vertical Pavement Deflection - Joint No. 89

Axle Load: Front - 9150 lb. Rear - 17,350 lb.

Time - 0800 29 Nov. 1973

Air Temp. - 32 F Pavement Surface Temp. - 29 F

Figure V - 73

K•E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 0780

Vertical Pavement Deflection - Joint No. 89

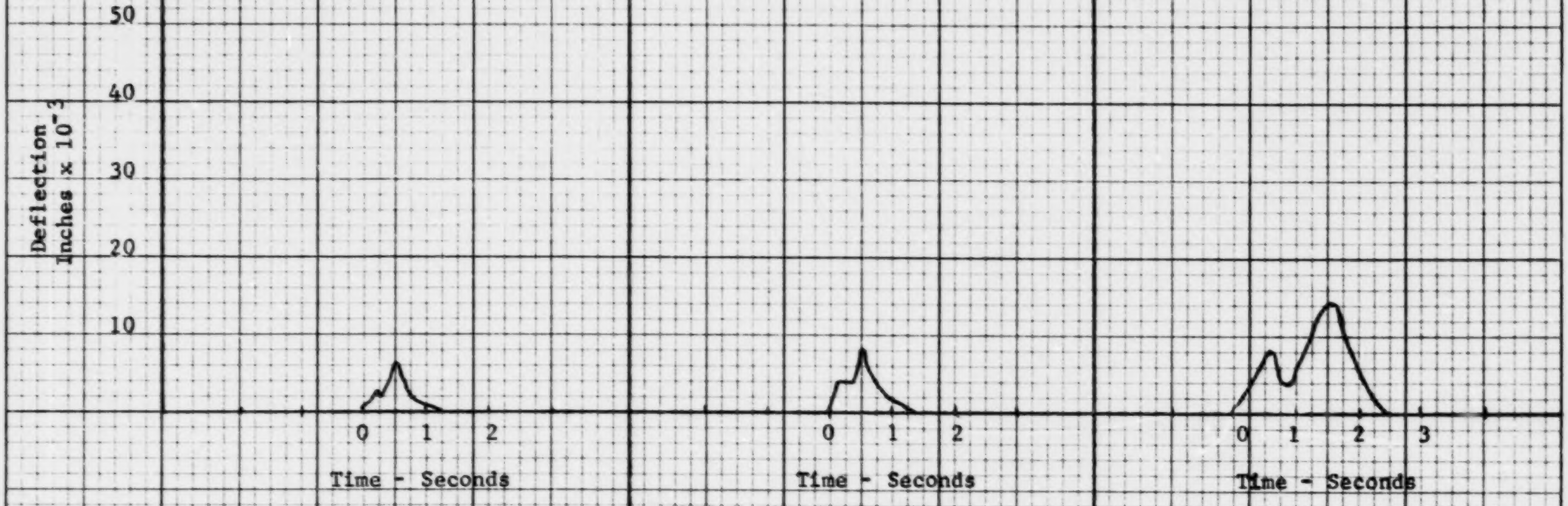
Axle Load: Front - 9150 lb. Rear - 17,850 lb.

Time - 1300

29 Nov. 1973

Air Temp - 38 F

Pavement Surface Temp - 38 F



Truck in Center of Passing Lane - 55 mph

Truck at Edge of Passing Lane - 55 mph

Truck at Edge of Passing Lane - 10 mph

Figure V - 74

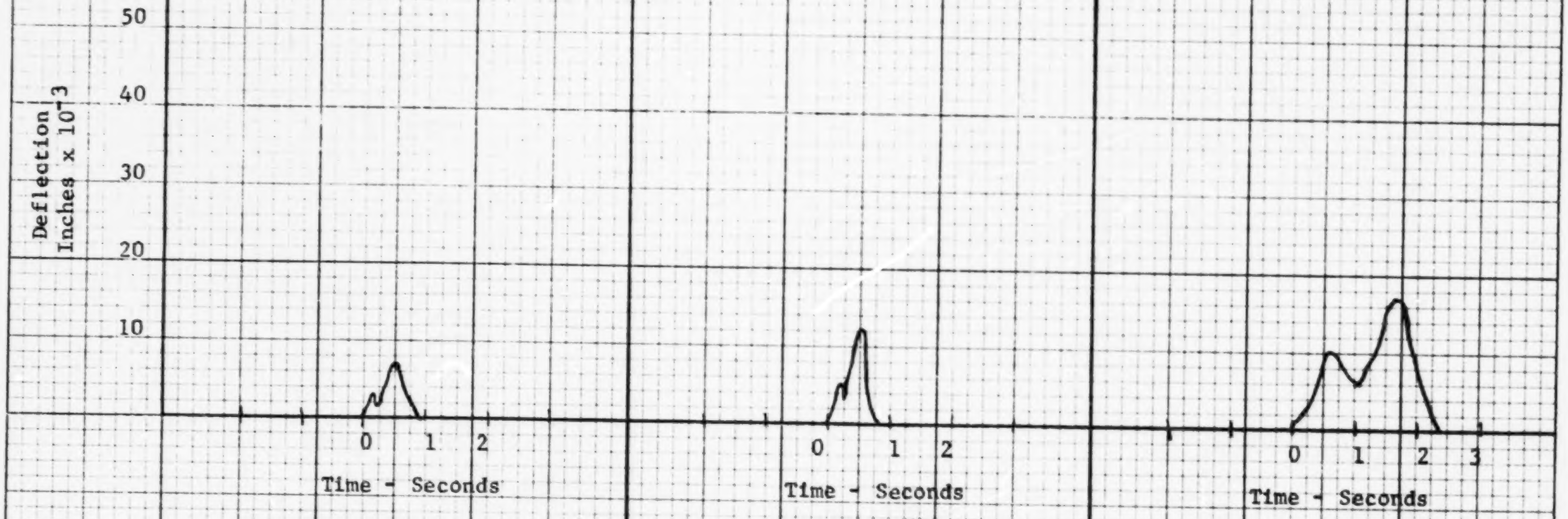
46 0780

Vertical Pavement Deflection - Joint No. 98

Axle Load: Front - 9150 lb. Rear 17,350 lb.

Time - 0800 29 Nov. 1973

Air Temp - 32 F Pavement Surface Temp - 29 F



Truck in Center of Passing Lane - 55 mph

Truck at Edge of Passing Lane - 55 mph

Truck at Edge of Passing Lane - 10 mph

Figure V - 75

46 0780

Vertical Pavement Deflection - Joint No. 98

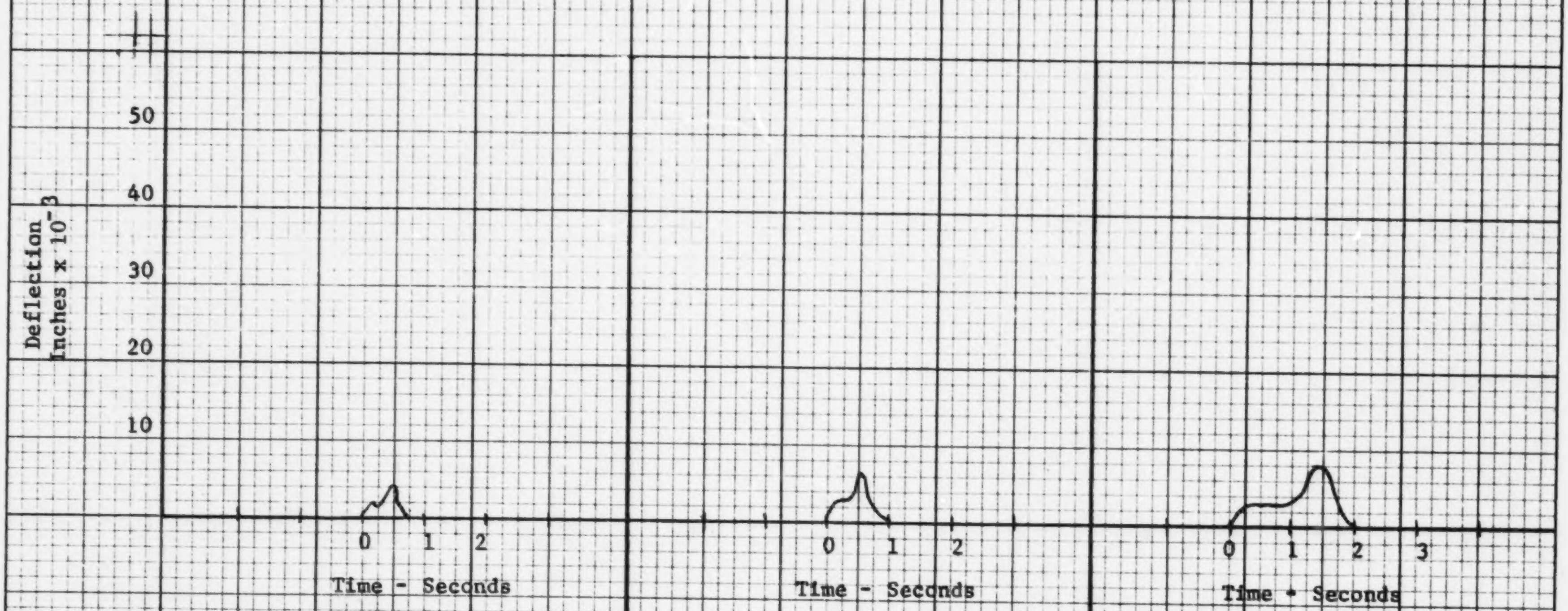
Axle Load: Front - 9150 lb. Rear - 17,350 lb.

Time - 1300

29 Nov. 1973

Air Temp - 38 F

Pavement Surface Temp - 38 F



Truck in Center of Passing Lane - 55 mph

Truck at Edge of Passing Lane - 55 mph

Truck at Edge of Passing Lane - 10 mph

Figure V - 76

K•E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 0780

Vertical Pavement Deflection - Joint No. 4

Axle Load: Front - 10,000 lb. Rear - 16,350 lb.

Time - 0800
28 Feb. 1974

Air Temp - 44 F
Pavement Surface Temp - 40 F

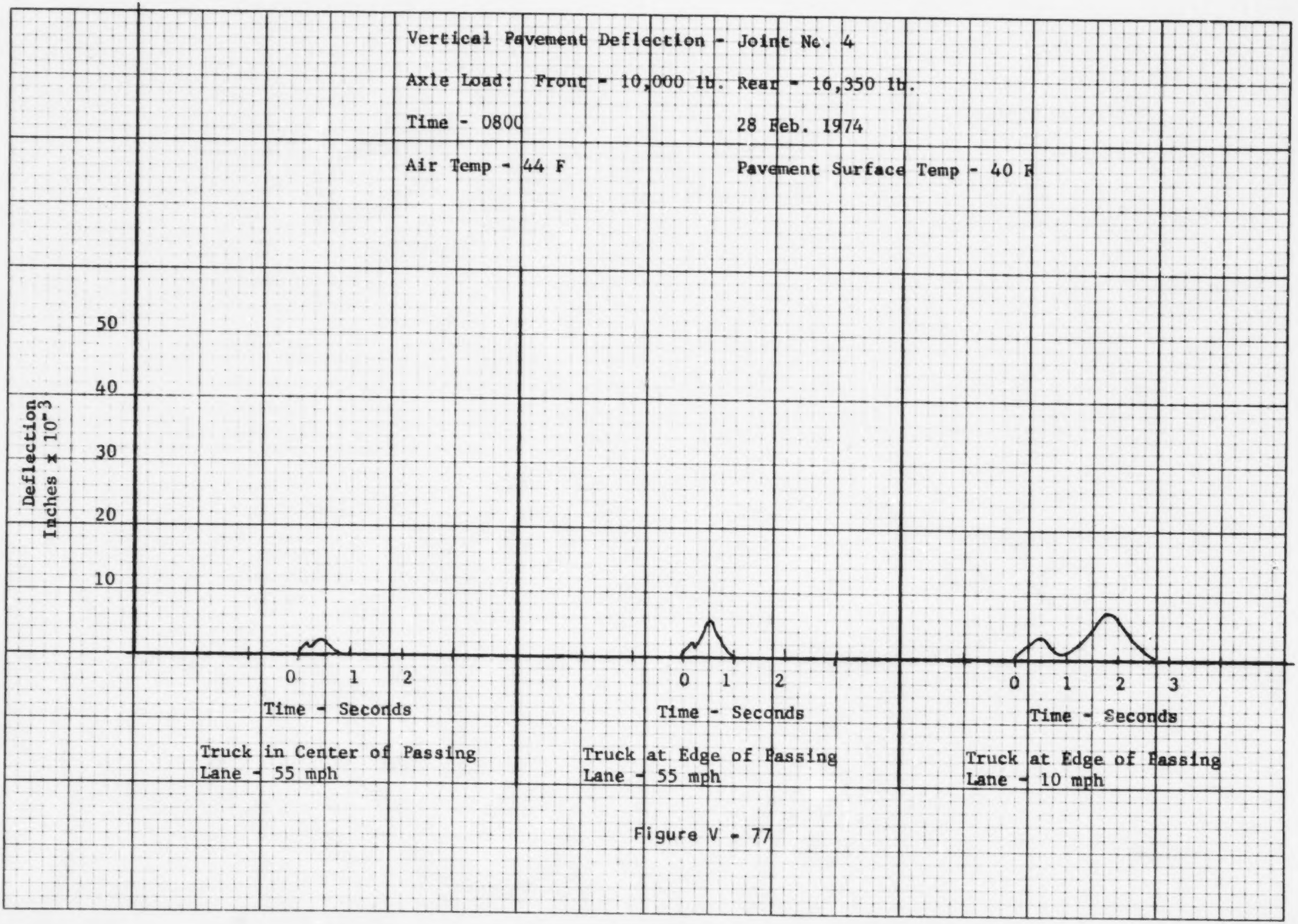
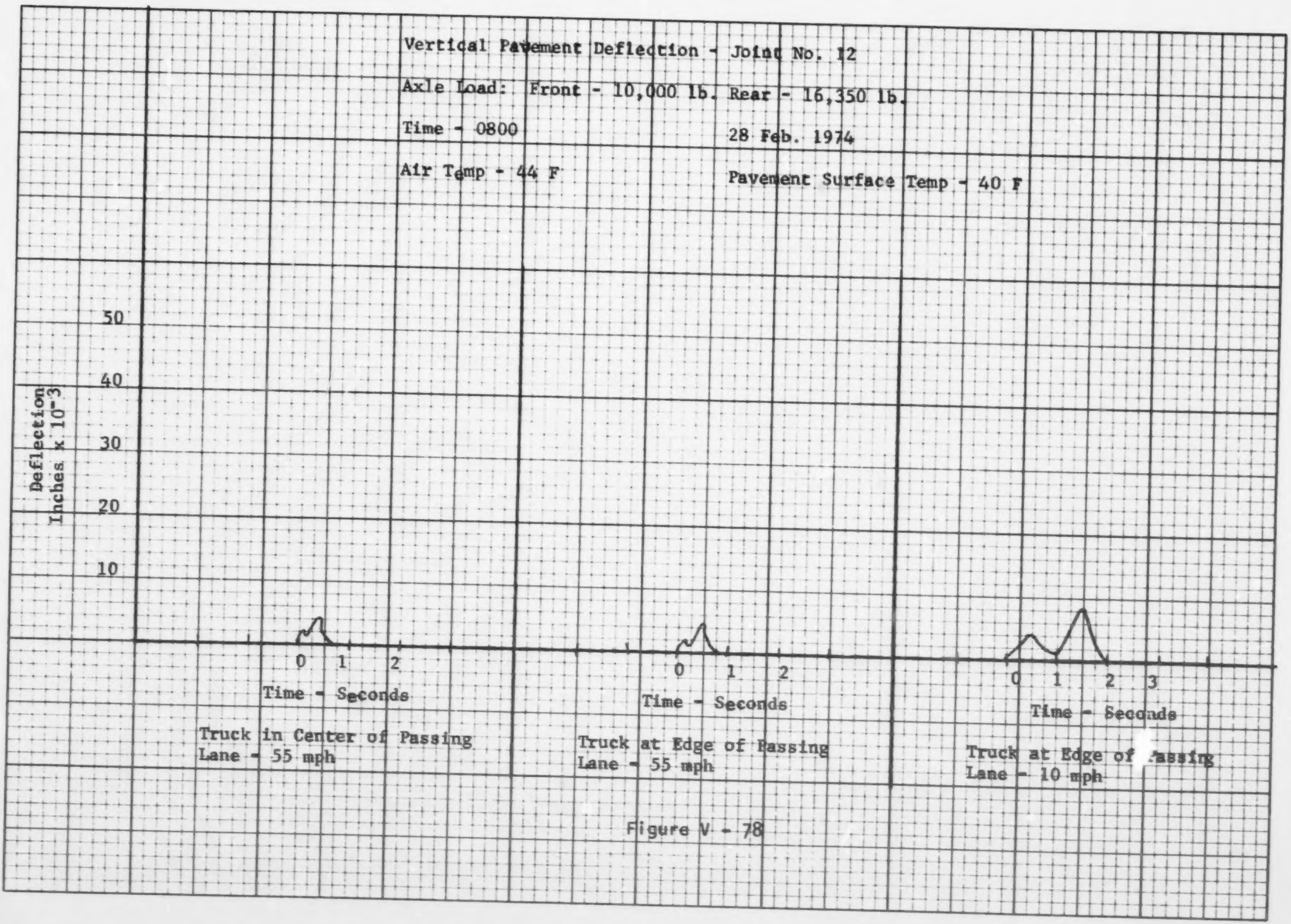


Figure V - 77

46 0780



Vertical Pavement Deflection - Joint No. 12

Axle Load: Front - 10,000 lb. Rear - 16,350 lb.

Time - 0800

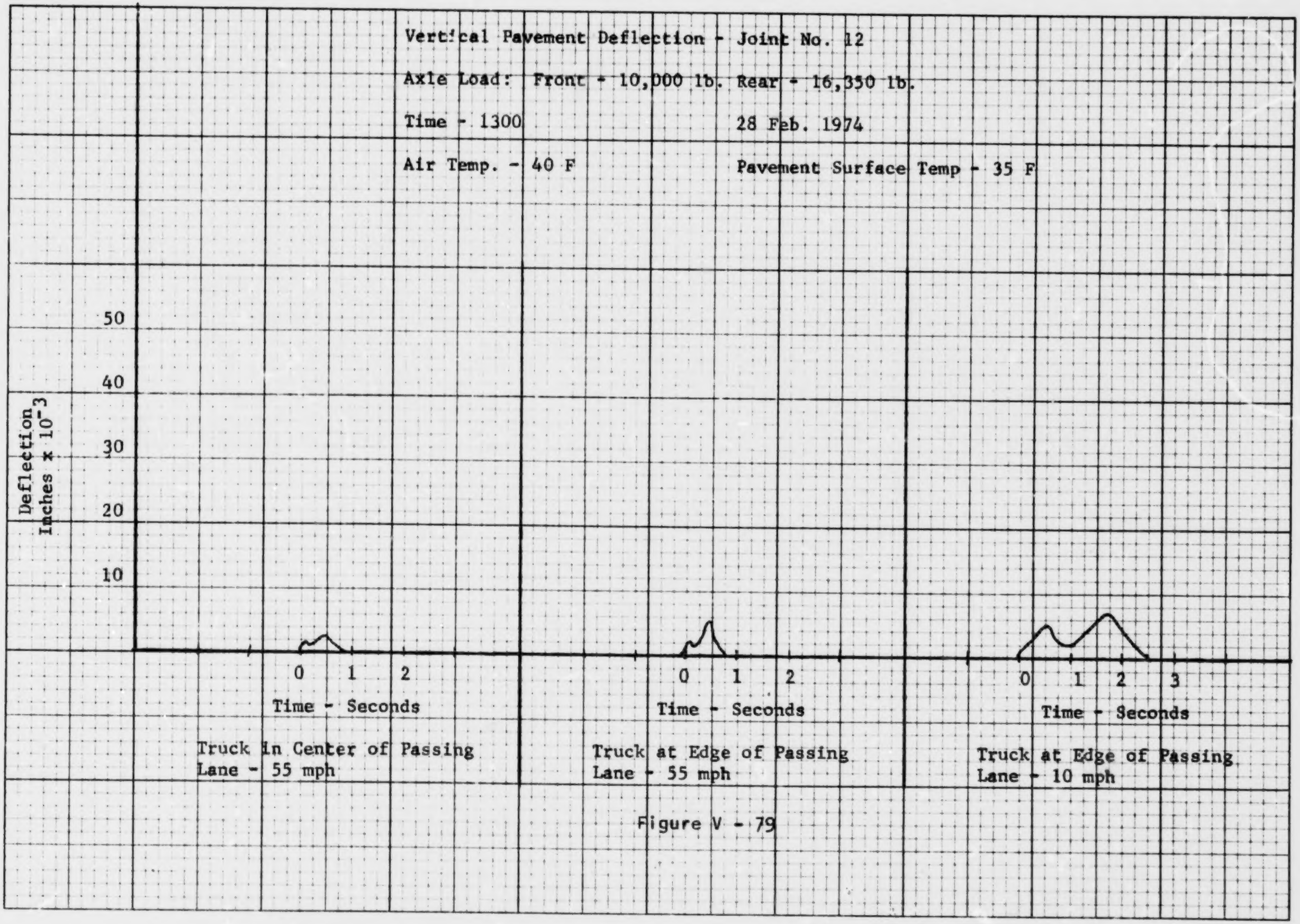
28 Feb. 1974

Air Temp - 44 F

Pavement Surface Temp - 40 F

Figure V - 78

K•E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 0780



Vertical Pavement Deflection - Joint No. 12

Axle Load: Front - 10,000 lb. Rear - 16,350 lb.

Time - 1300

28 Feb. 1974

Air Temp. - 40 F

Pavement Surface Temp - 35 F

Truck in Center of Passing Lane - 55 mph

Truck at Edge of Passing Lane - 55 mph

Truck at Edge of Passing Lane - 10 mph

Figure V - 79

K+E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.

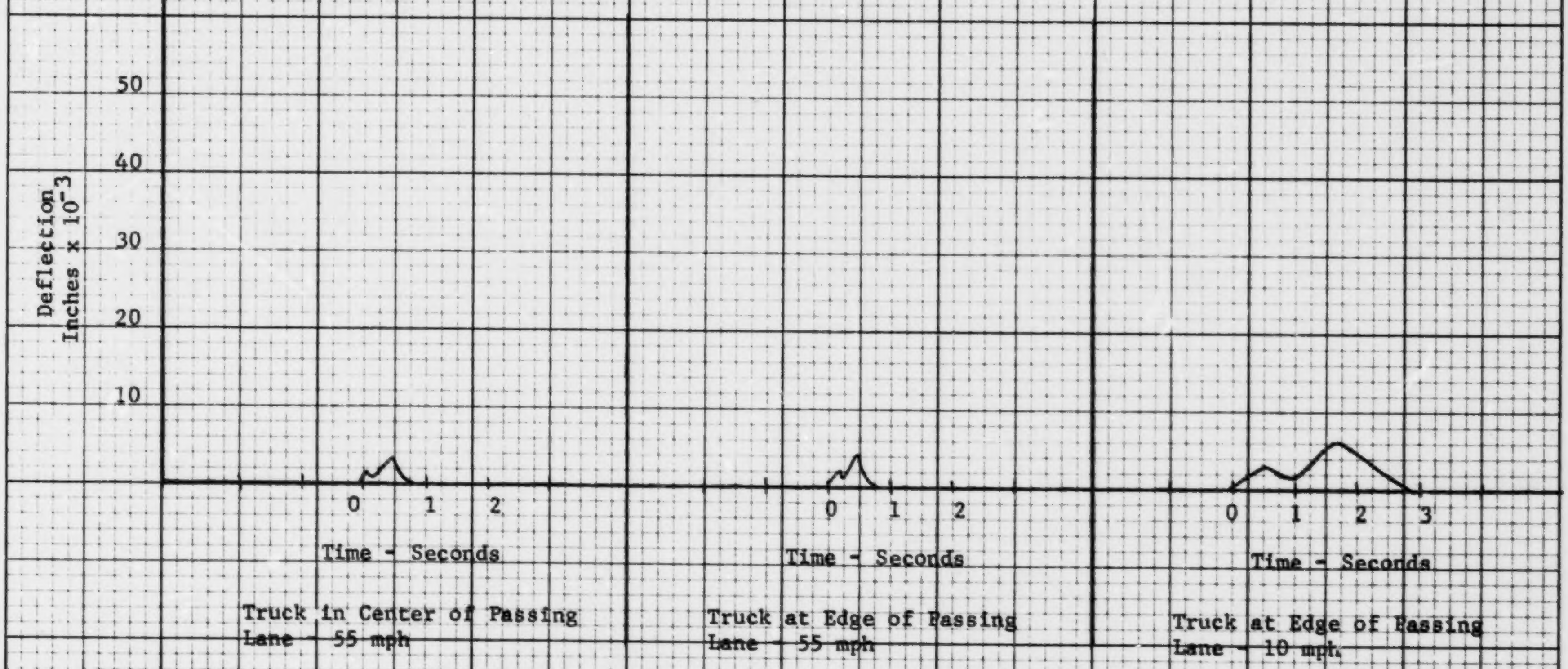
46 0780

Vertical Pavement Deflection - Joint No. 21

Axle Load: Front - 10,000 lb. Rear - 16,350 lb.

Time - 0800 28 Feb. 1974

Air Temp - 44 F Pavement Surface Temp - 40 F



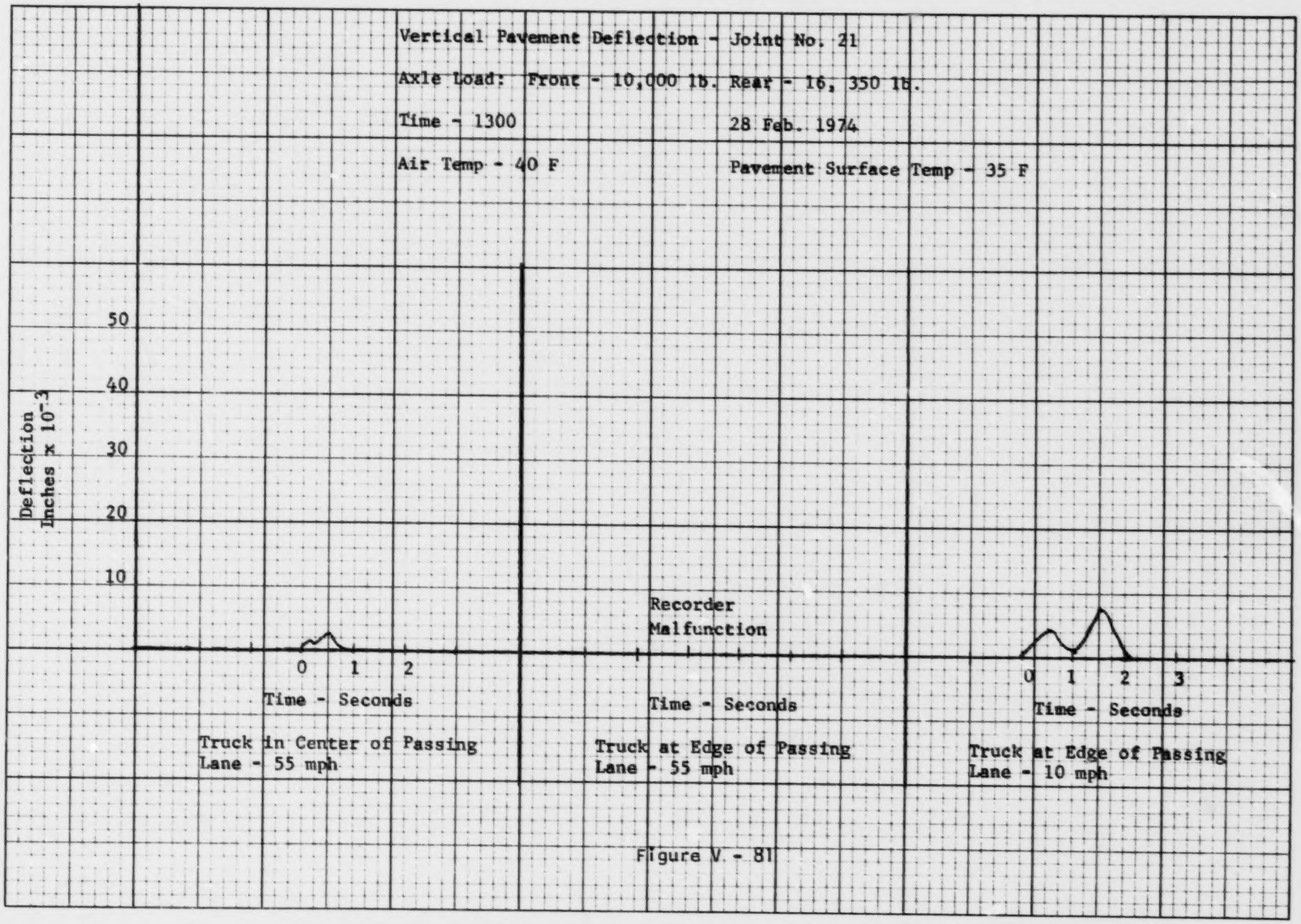
Truck in Center of Passing Lane - 55 mph

Truck at Edge of Passing Lane - 55 mph

Truck at Edge of Passing Lane - 10 mph

Figure V - 80

K•E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 0780



Vertical Pavement Deflection - Joint No. 21

Axle Load: Front - 10,000 lb. Rear - 16, 350 lb.

Time - 1300

28 Feb. 1974

Air Temp - 40 F

Pavement Surface Temp - 35 F

Figure V - 81

K•E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 0780

Vertical Pavement Deflection - Joint No. 40

Axle Load: Front - 10,300 lb. Rear - 18,600 lb.

Time - 0800 7 March 1974

Air Temp - 59 F Pavement Surface Temp - 45 F

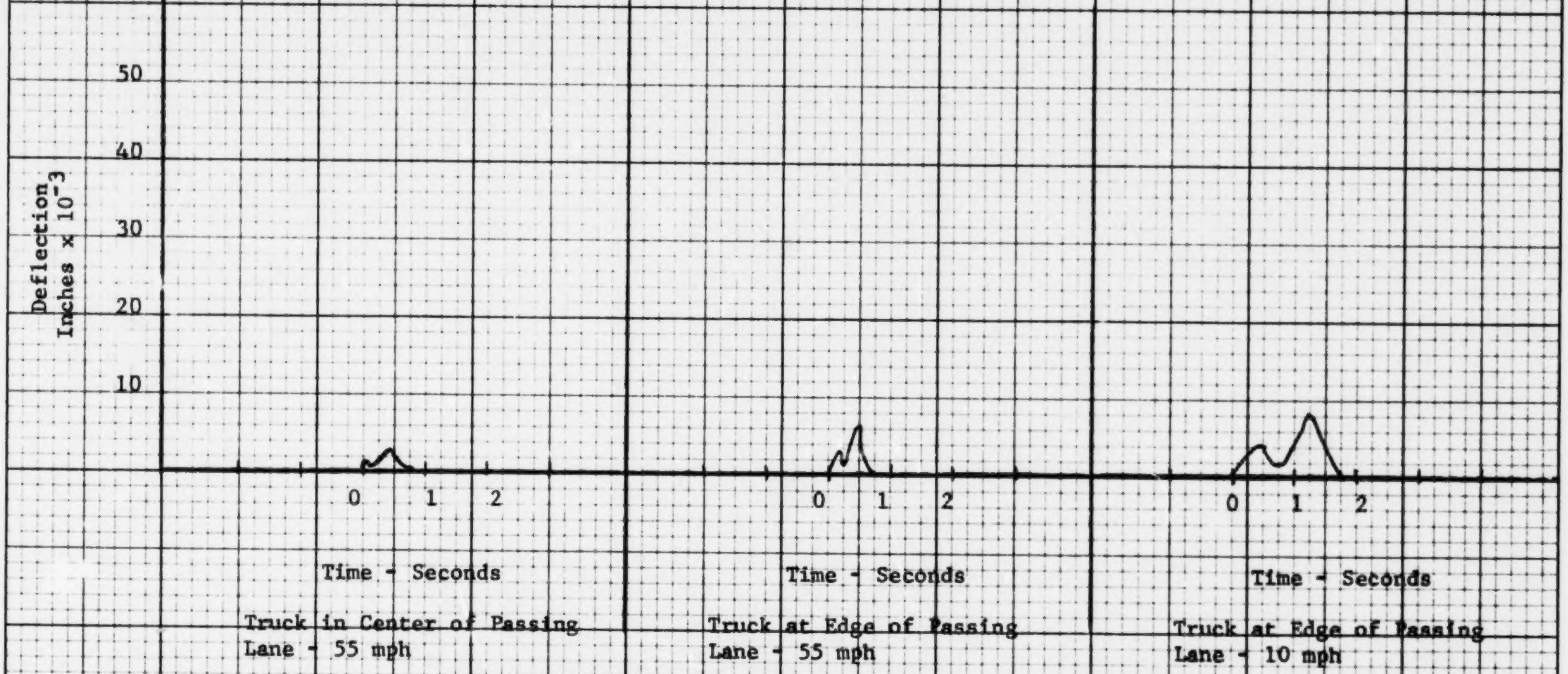


Figure V - 82

K•E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 0780

Vertical Pavement Deflection - Joint No. 49

Axle Load: Front - 10,300 lb. Rear - 18,600 lb.

Time - 0800 7 March 1974

Air Temp - 59 F Pavement Surface Temp - 45 F

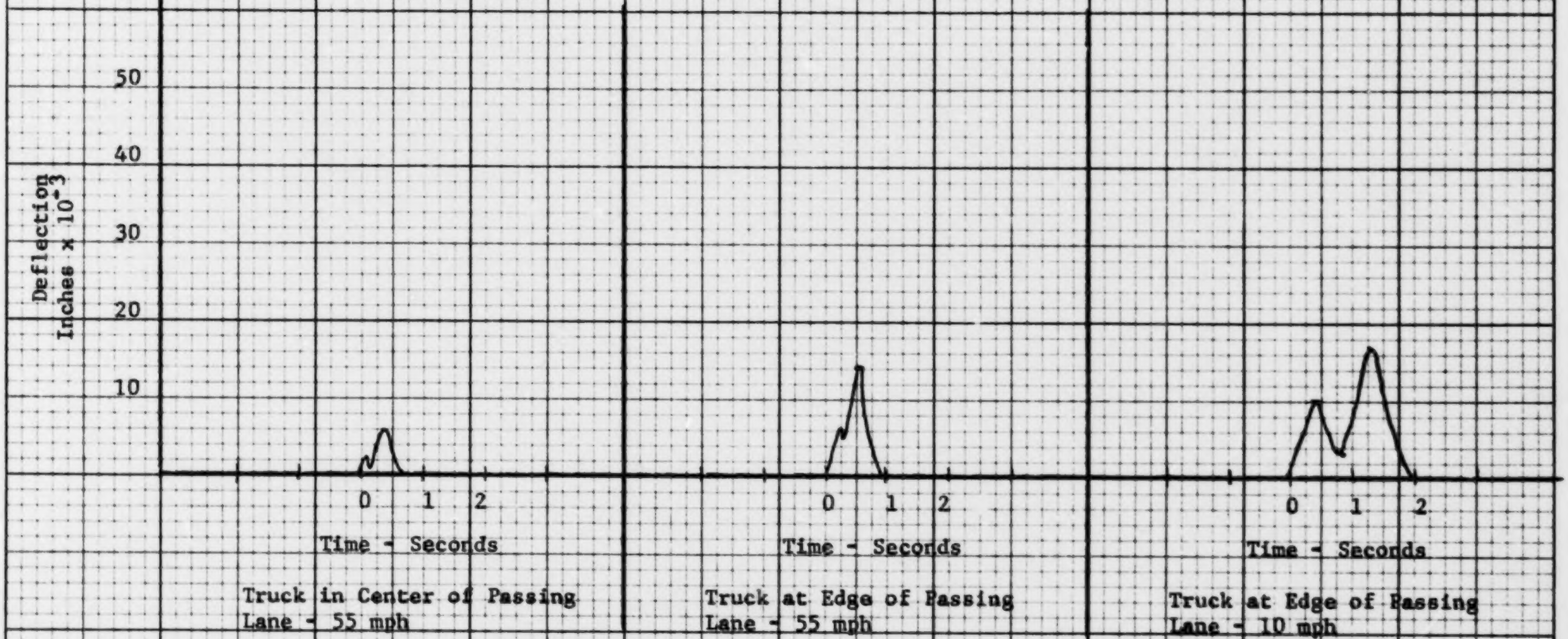


Figure V - 83

K•E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 0780

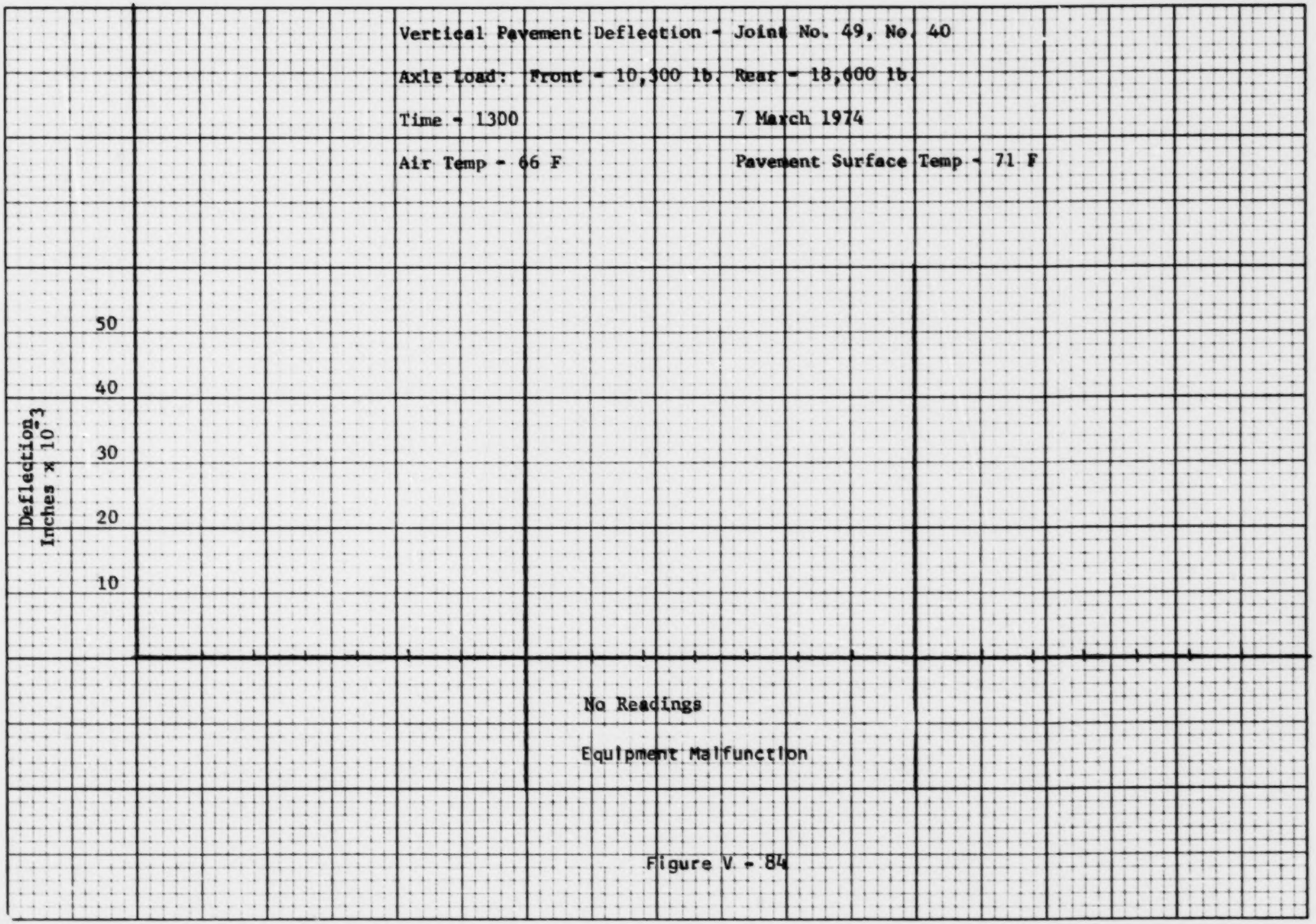
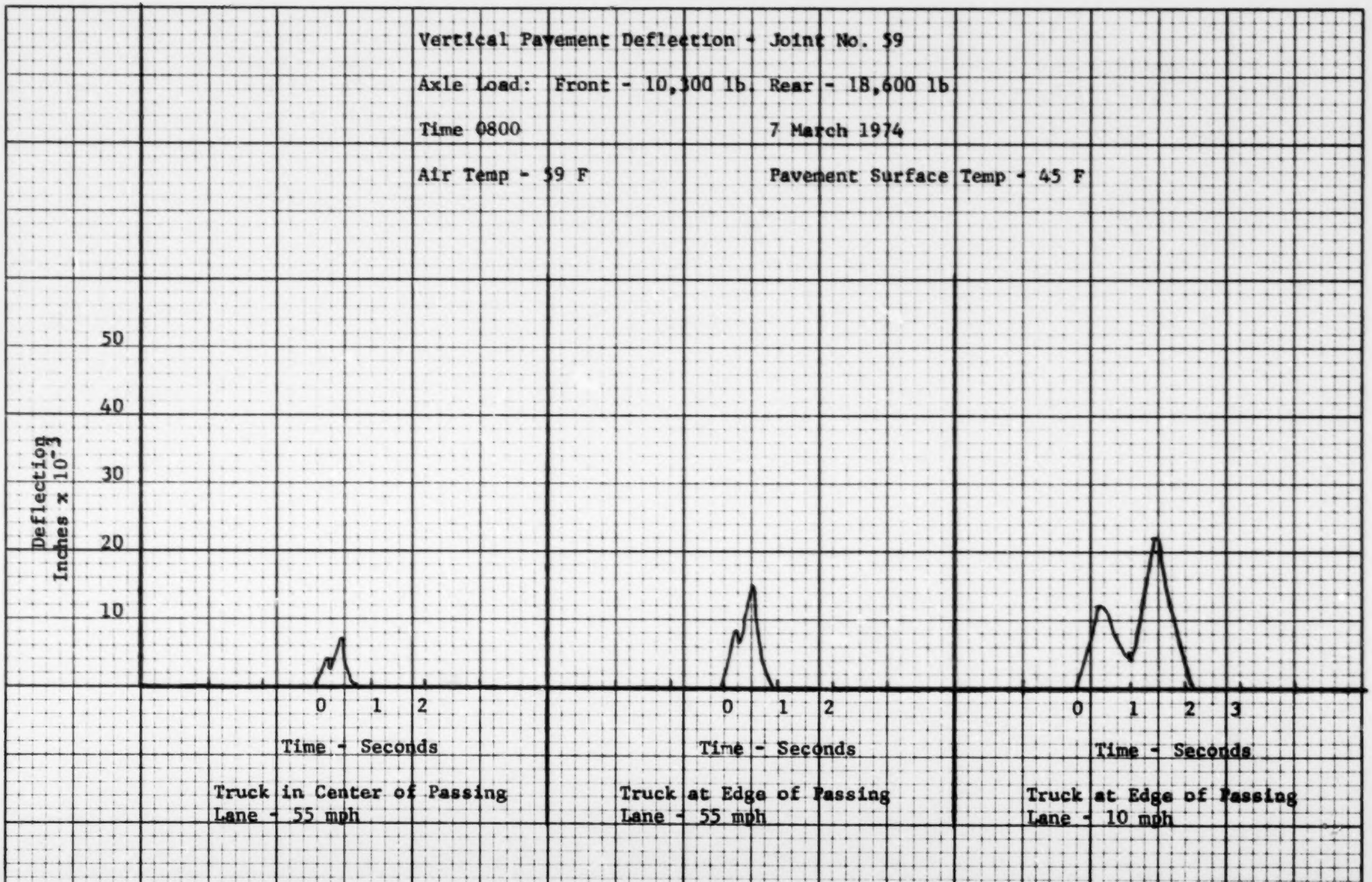


Figure V - 84

K•E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 0780



Vertical Pavement Deflection - Joint No. 59

Axle Load: Front - 10,300 lb. Rear - 18,600 lb.

Time 0800 7 March 1974

Air Temp - 59 F Pavement Surface Temp - 45 F

Truck in Center of Passing Lane - 55 mph

Truck at Edge of Passing Lane - 55 mph

Truck at Edge of Passing Lane - 10 mph

Figure V - 85

K•E 10 X 10 TO THE INCH• 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 0780

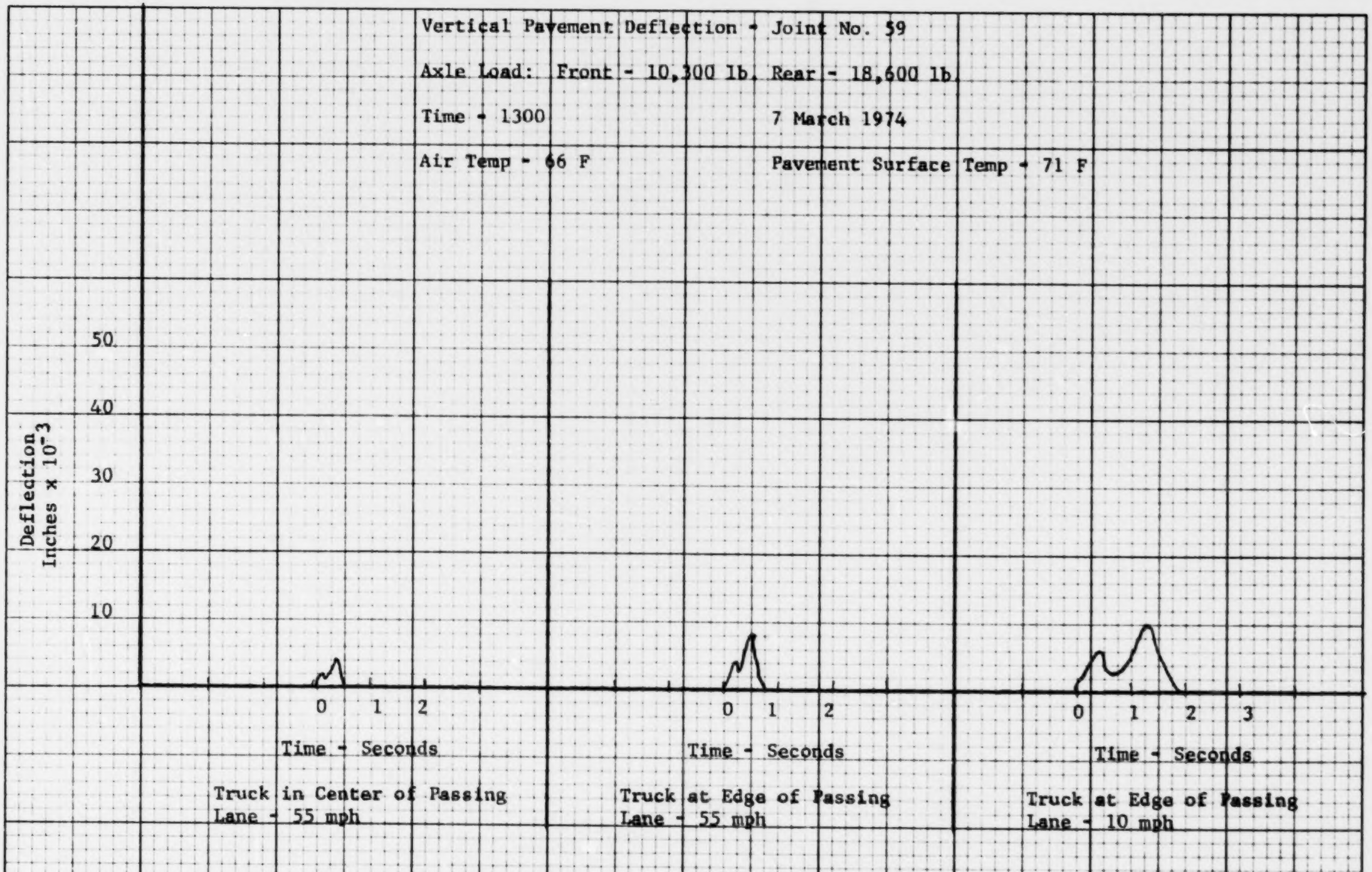


Figure V - 86

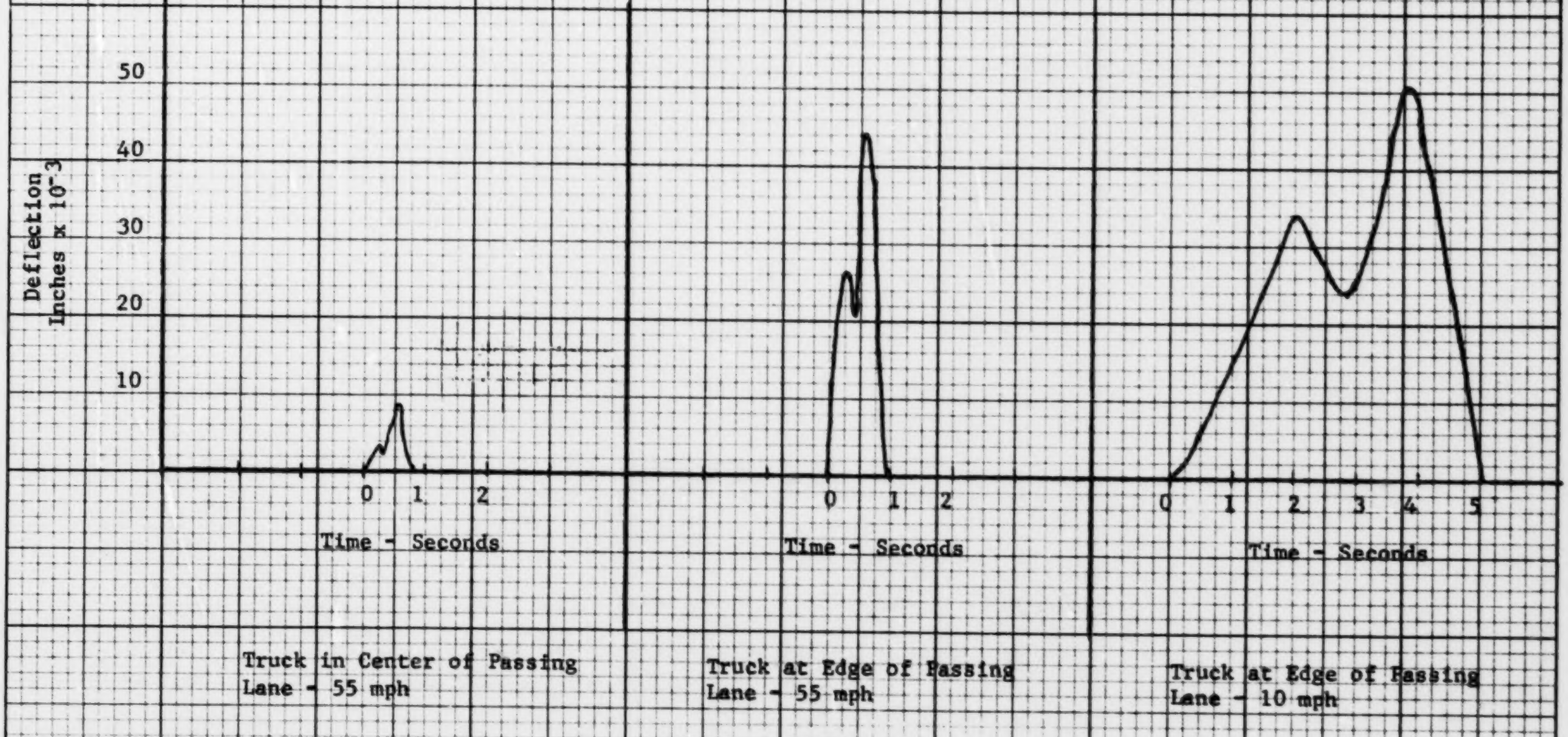
K•E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 0780

Vertical Pavement Deflection - Joint No. 78

Axle Load: Front - 9700 lb. Rear - 16,400 lb.

Time - 0800 14 March 1974

Air Temp - 30F Pavement Surface Temp - 20F



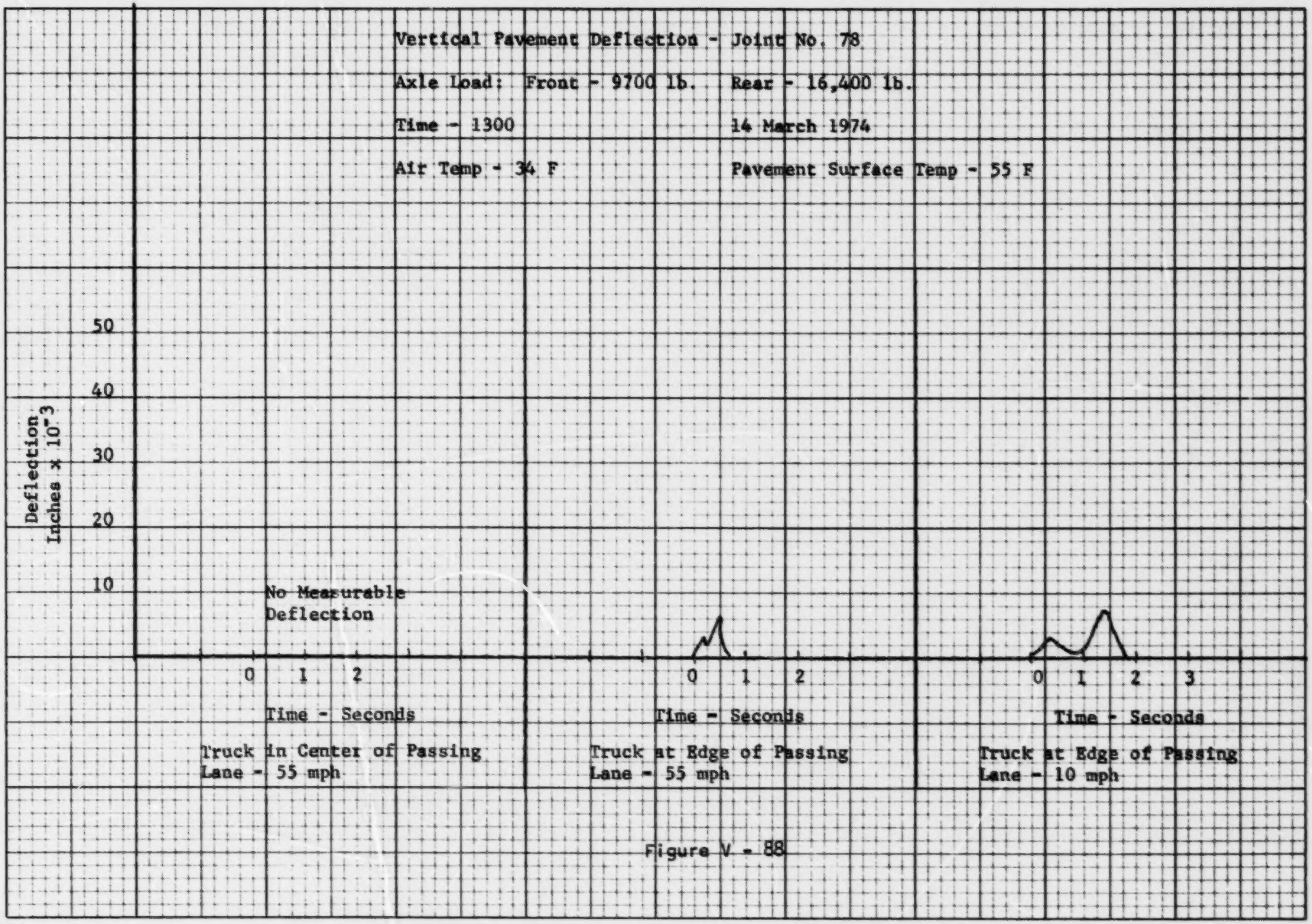
Truck in Center of Passing Lane - 55 mph

Truck at Edge of Passing Lane - 55 mph

Truck at Edge of Passing Lane - 10 mph

Figure V - 87

K•E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 0780



Vertical Pavement Deflection - Joint No. 78

Axle Load: Front - 9700 lb. Rear - 16,400 lb.

Time - 1300 14 March 1974

Air Temp - 34 F Pavement Surface Temp - 55 F

Figure V - 88

K•E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 0780

Vertical Pavement Deflection - Joint No. 89

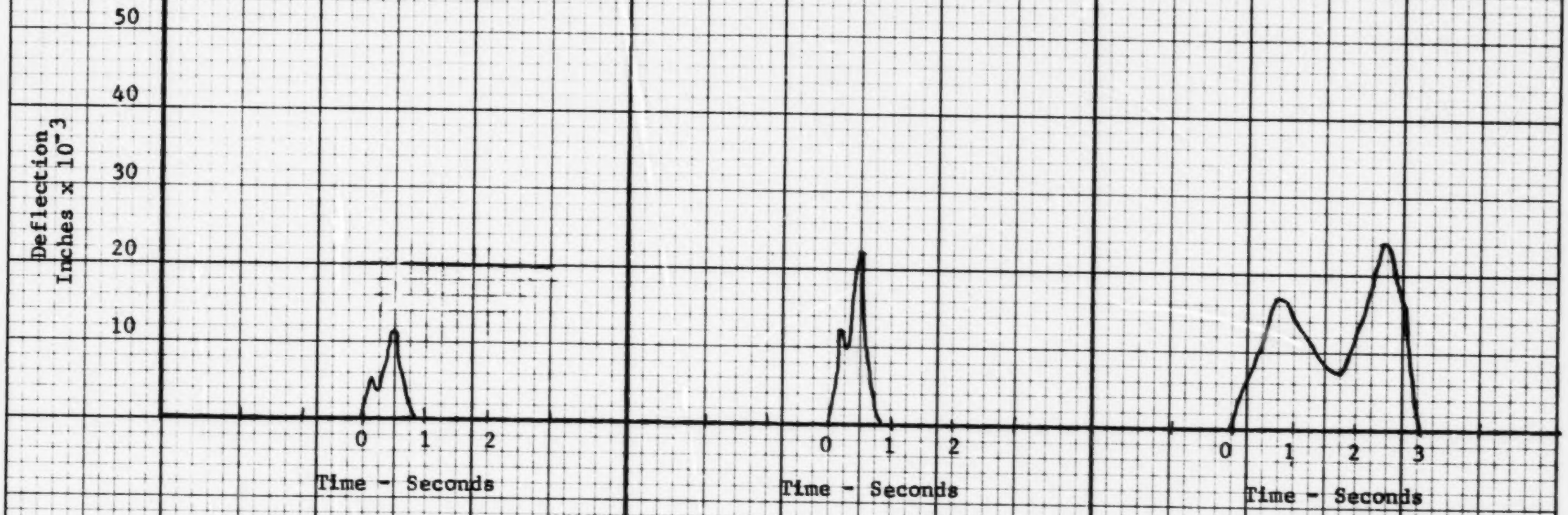
Axle Load: Front - 9700 lb. Rear - 16,400 lb.

Time - 0800

14 March 1974

Air Temp - 30 F

Pavement Surface Temp - 20 F



Truck in Center of Passing Lane - 55 mph

Truck at Edge of Passing Lane - 55 mph

Truck at Edge of Passing Lane - 10 mph

Figure V - 89

K•E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 0780

Vertical Pavement Deflection - Joint No. 89

Axle Load: Front - 9700 lb. Rear - 16,400 lb.

Time - 1300

14 March 1974

Air Temp - 34 F

Pavement Surface Temp - 55 F

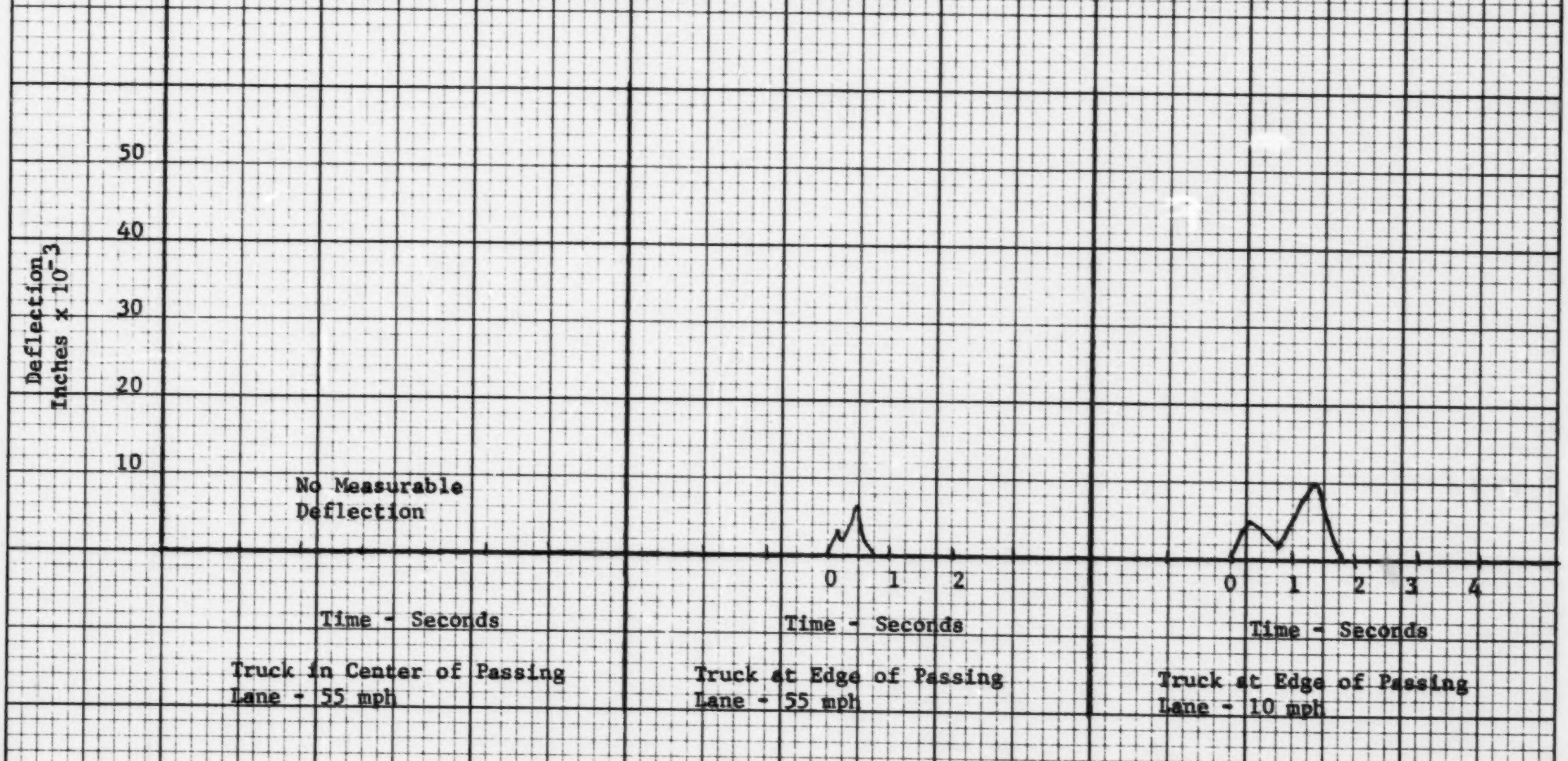


Figure V - 90

K•E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 0780

Vertical Pavement Deflection - Joint No. 4

Axle Load: Front - 9400 lb. Rear - 17,250 lb.

Time - 0800 25 June 1974

Air Temp - 52 F Pavement Surface Temp - 50 F

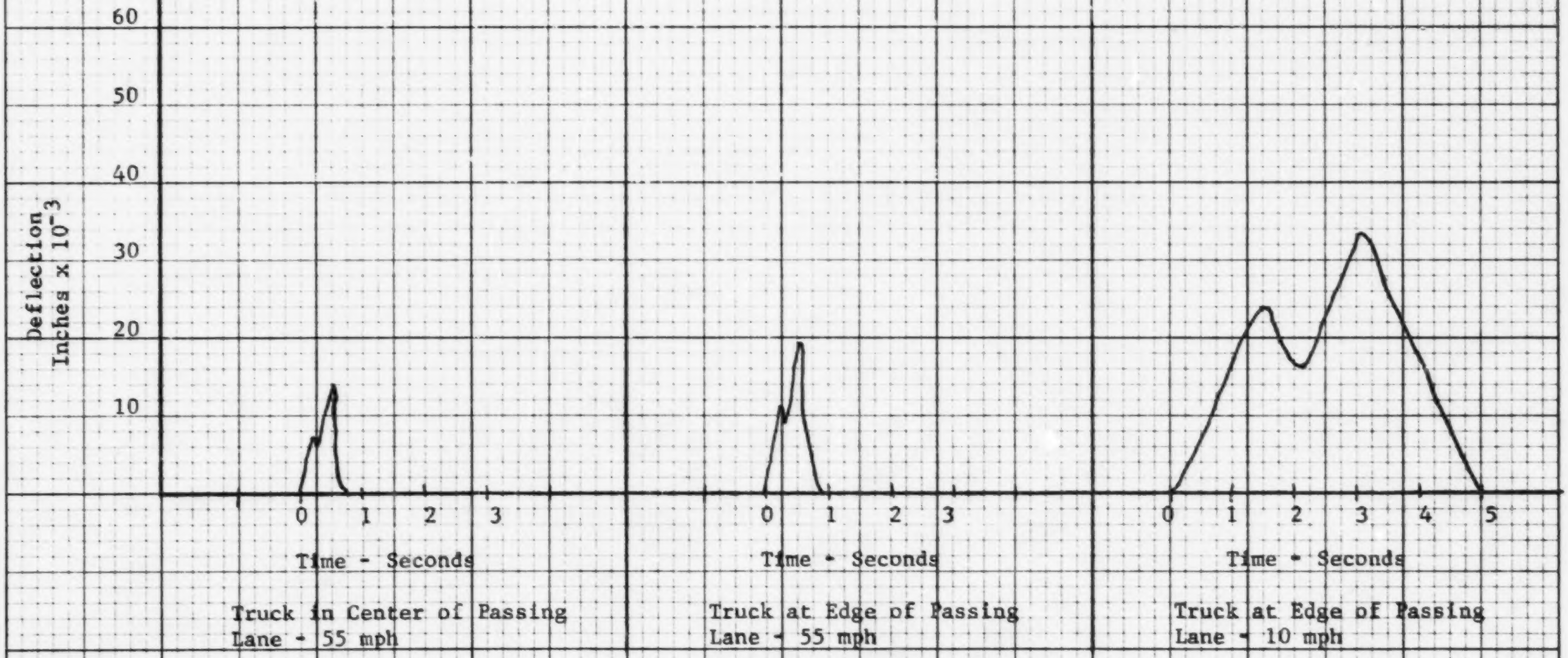


Figure V - 91

K•E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 0780

Vertical Pavement Deflection - Joint No. 4

Axle Load: Front - 9400 lb. Rear - 17,250 lb.

Time - 1300 25 June 1974

Air Temp - 74 F Pavement Surface Temp. - 88 F

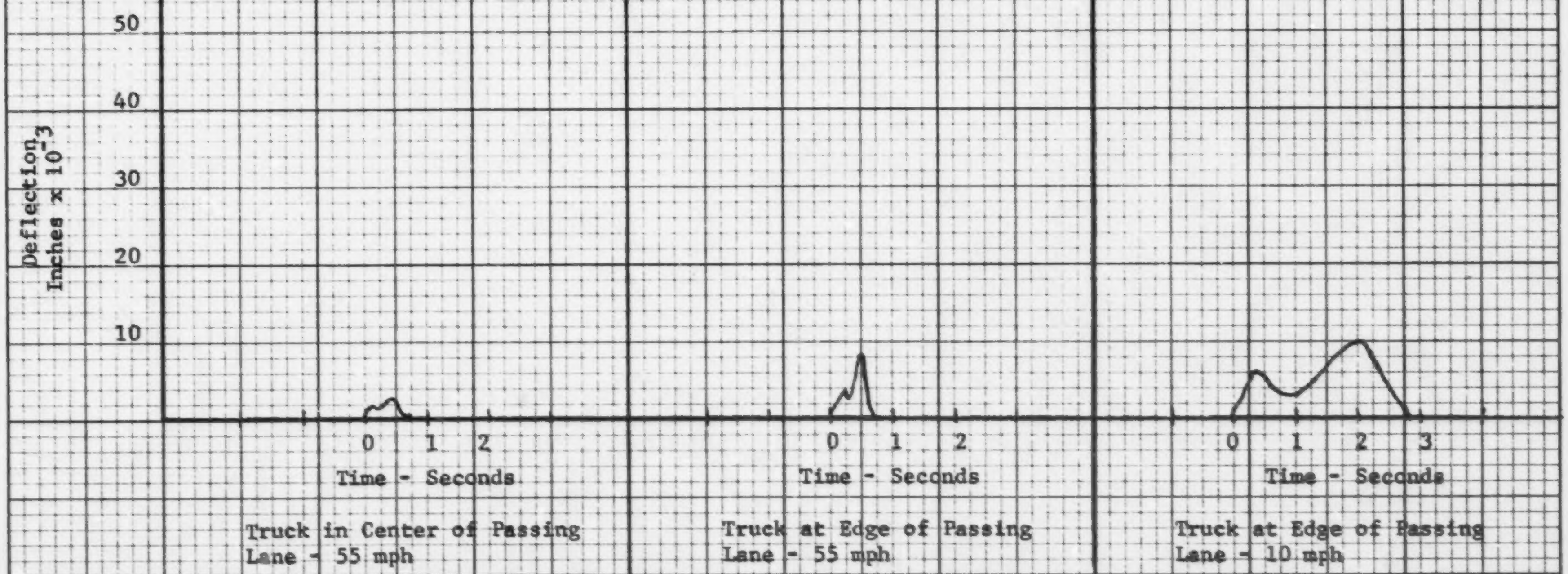


Figure V - 92

K•E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 0780

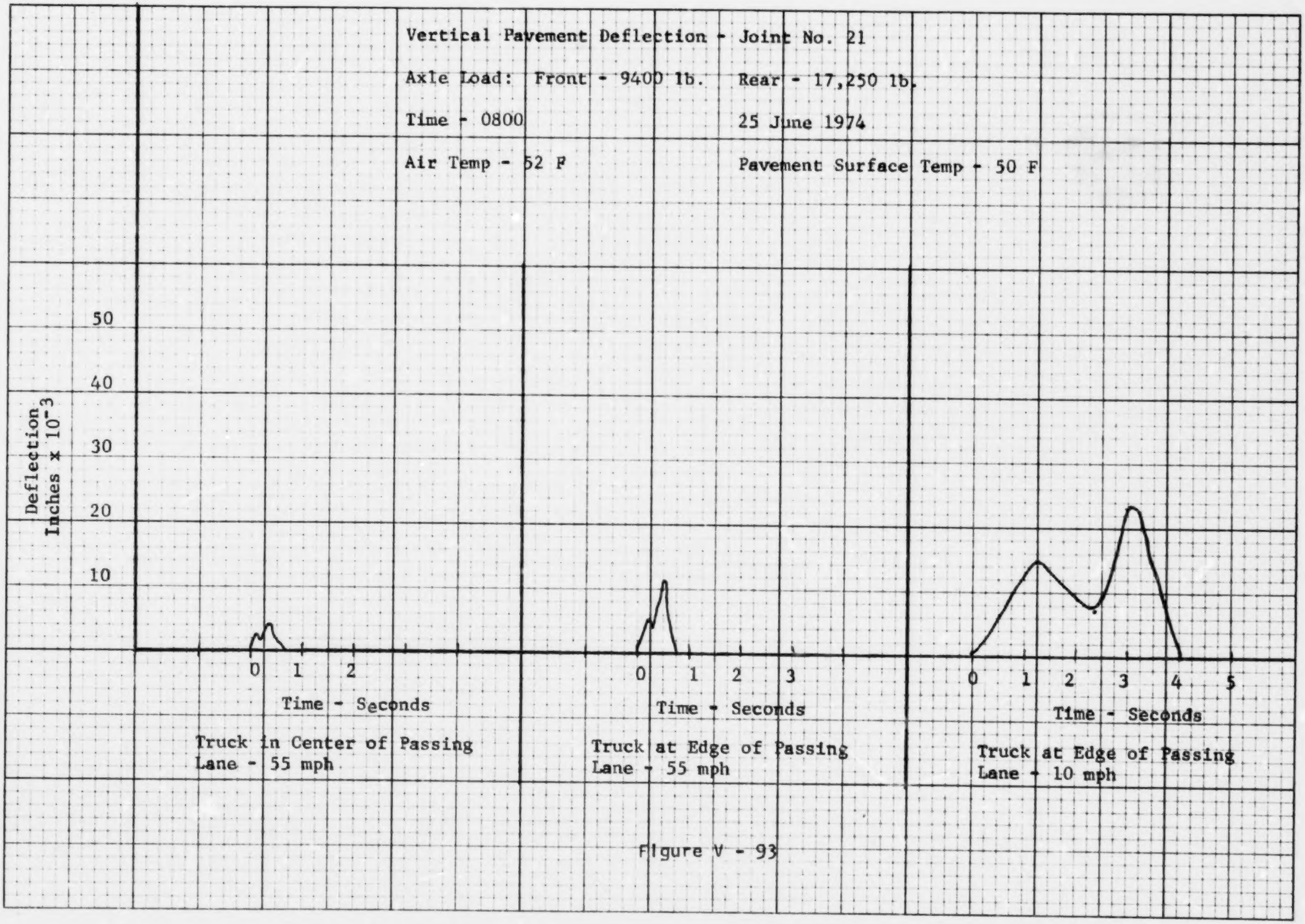
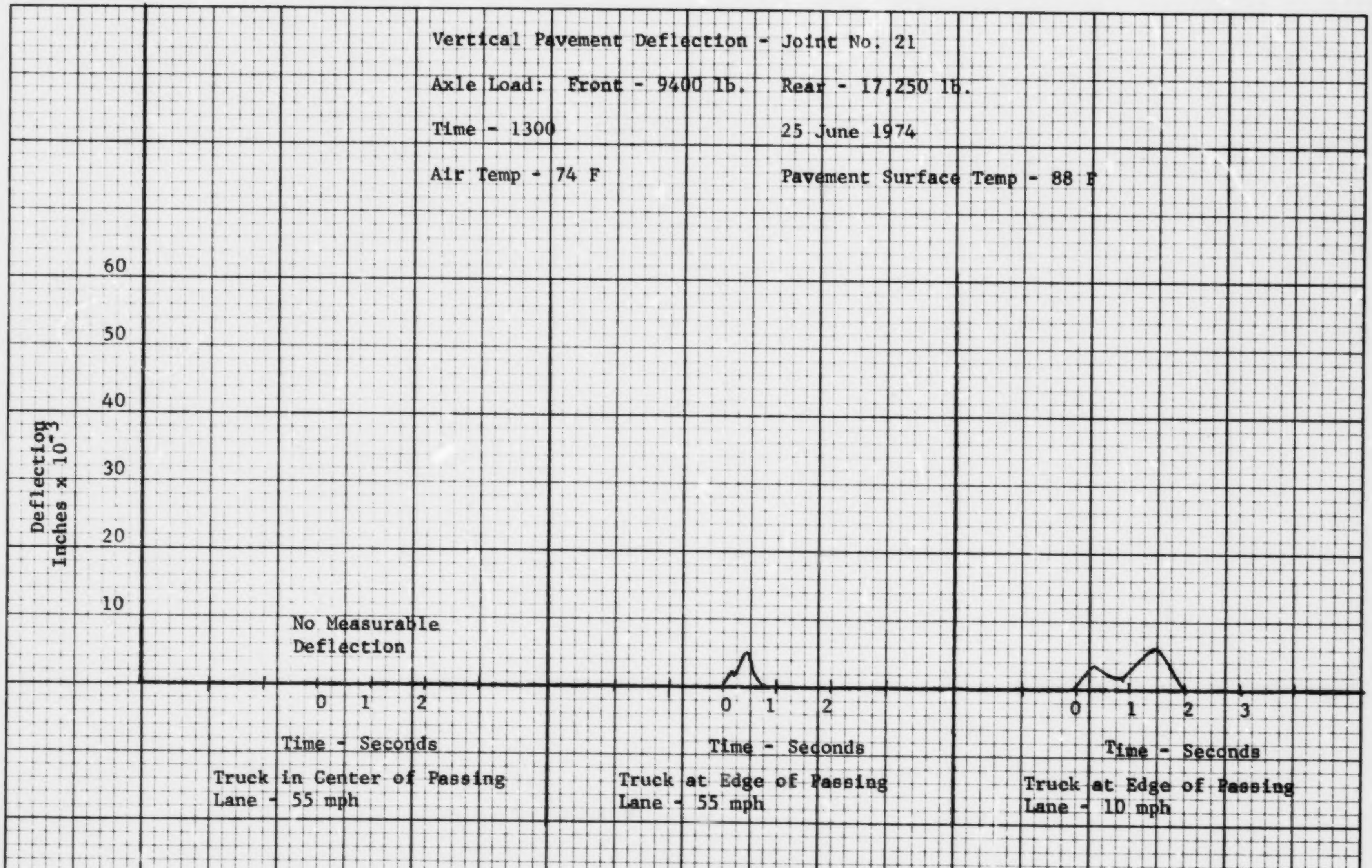


Figure V - 93

K+E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 0780


Vertical Pavement Deflection - Joint No. 21

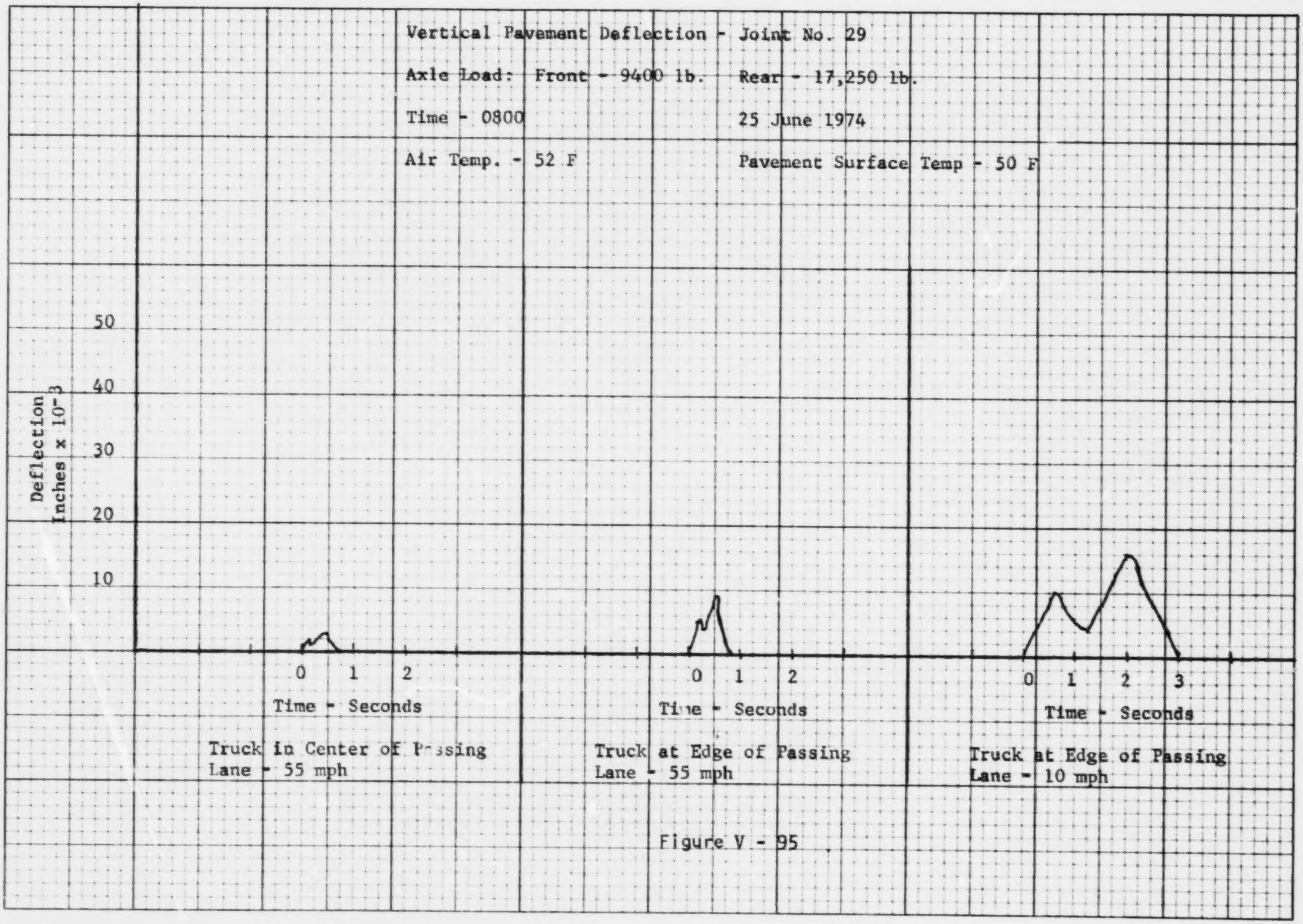
Axle Load: Front - 9400 lb. Rear - 17,250 lb.

Time - 1300 25 June 1974

Air Temp - 74 F Pavement Surface Temp - 88 F

Figure V - 94

K+E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 0780



Vertical Pavement Deflection - Joint No. 29

Axle Load: Front - 9400 lb. Rear - 17,250 lb.

Time - 0800 25 June 1974

Air Temp. - 52 F Pavement Surface Temp - 50 F

Figure V - 95

K•E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 0780

Vertical Pavement Deflection - Joint No. 29

Axle Load: Front - 9400 lb. Rear - 17,250 lb.

Time - 1300 25 June 1974

Air Temp - 74 F Pavement Surface Temp - 88 F

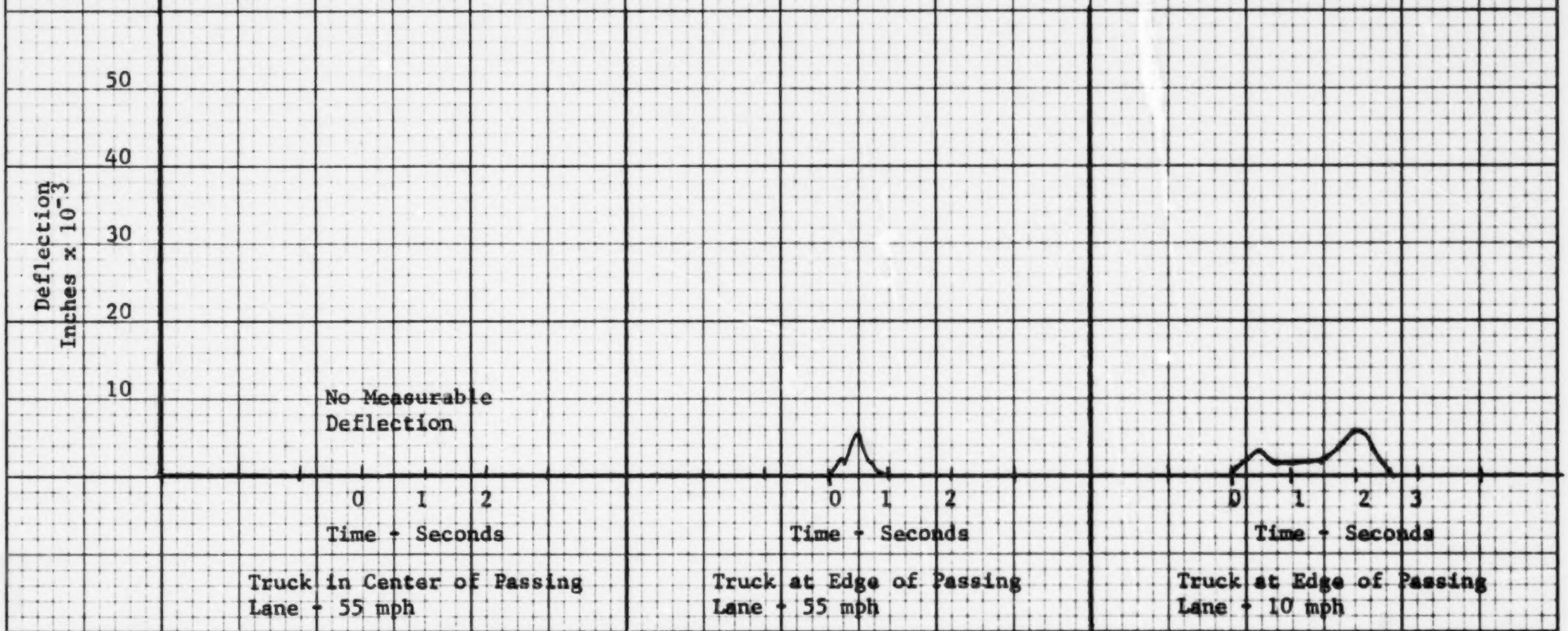


Figure V - 96

K·E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 0780

Vertical Pavement Deflection - Joint No. 40

Axle Load: Front - 9400 lb. Rear - 17,250 lb.

Time - 0800 25 June 1974

Air Temp - 52 F Pavement Surface Temp - 50 F

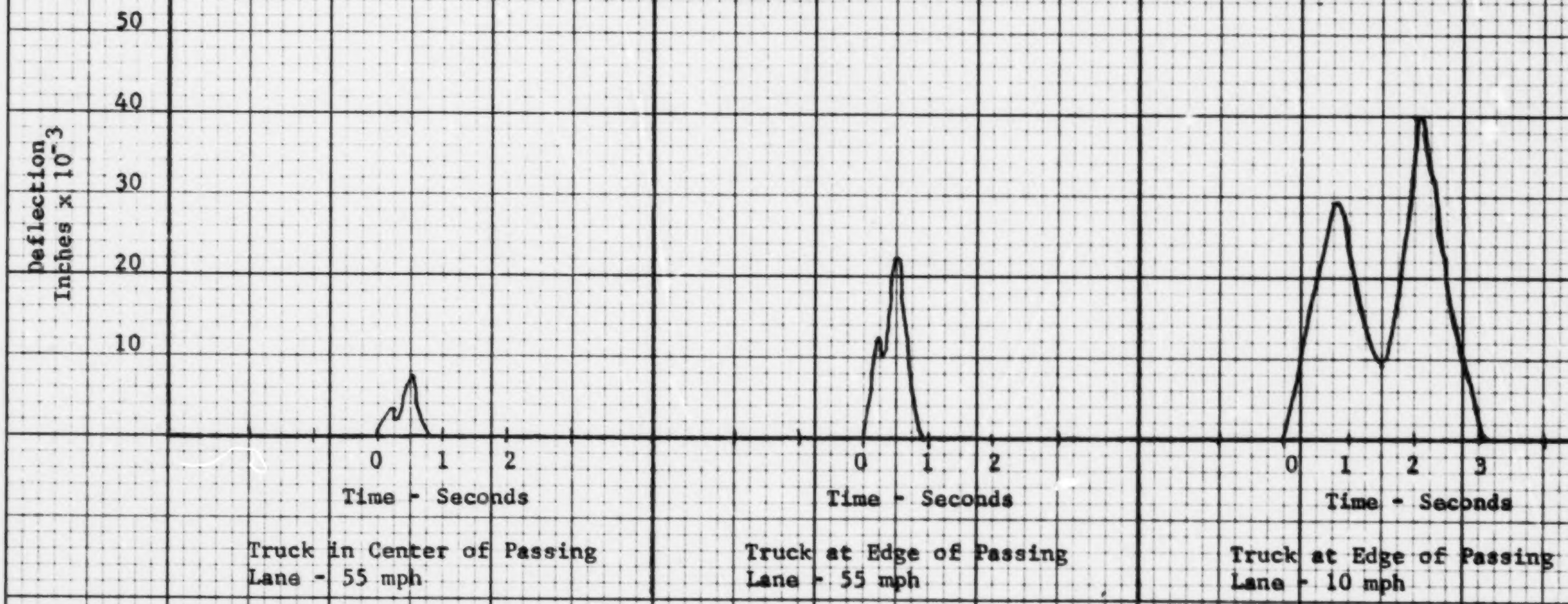


Figure V - 97

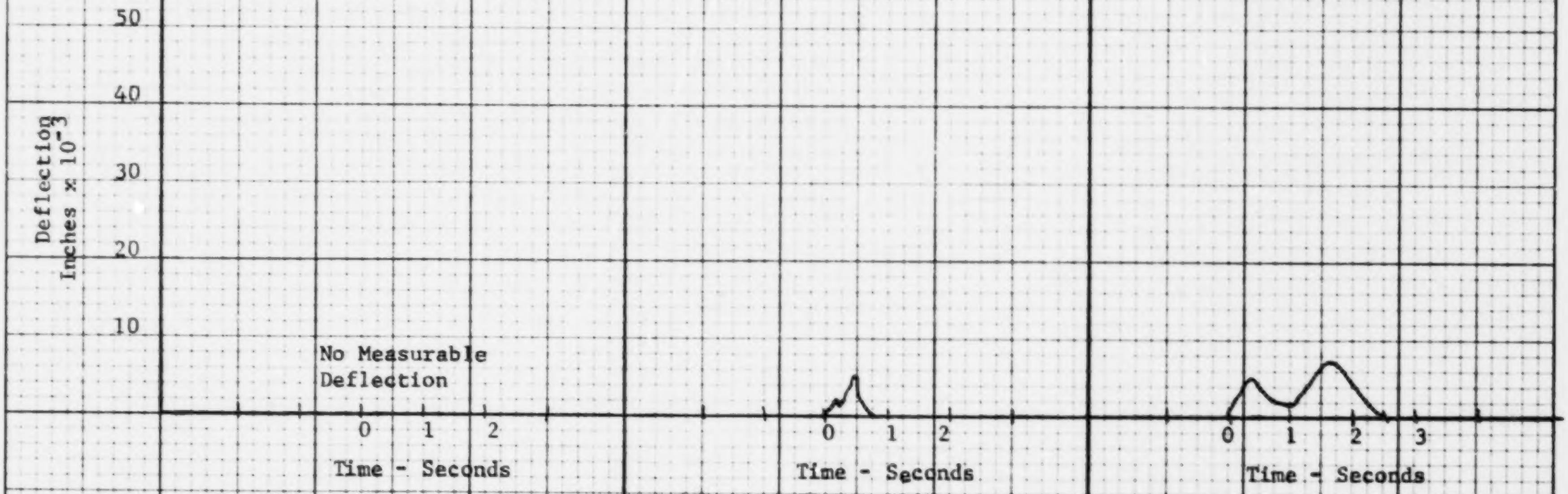
K•E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 0780

Vertical Pavement Deflection - Joint No. 40

Axle Load: Front - 9400 lb. Rear - 17,250 lb.

Time - 1300 25 June 1974

Air Temp - 74 F Pavement Surface Temp - 88 F



Truck in Center of Passing Lane - 55 mph

Truck at Edge of Passing Lane - 55 mph

Truck at Edge of Passing Lane - 10 mph

Figure V - 98

K•E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 0780

Vertical Pavement Deflection - Joint No. 49

Axle Load: Front - 9400 lb. Rear - 17,250 lb.

Time - 0800 25 June 1974

Air Temp - 52 F Pavement Surface Temp. - 50 F

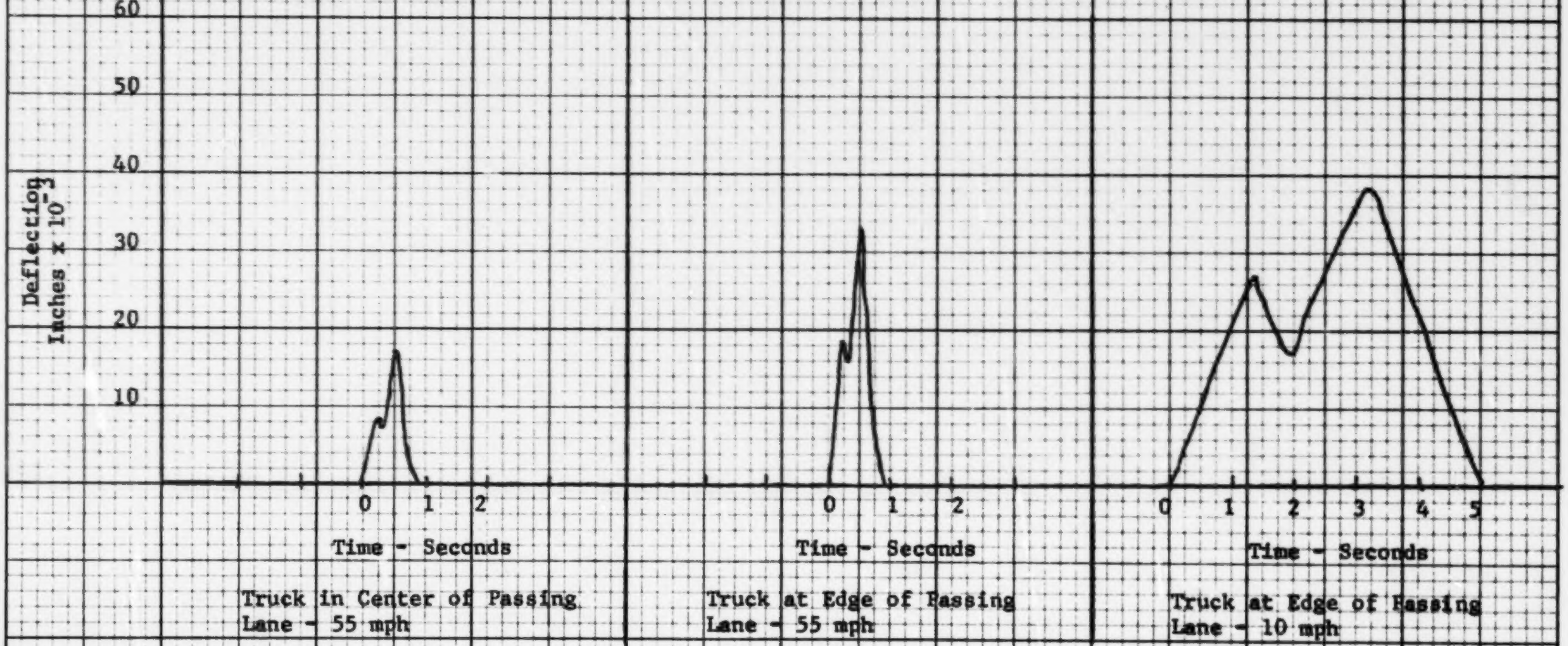


Figure V - 99

K+E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 0780

Vertical Pavement Deflection - Joint No. 49

Axle Load: Front - 9400 lb. Rear - 17,250 lb.

Time - 1300 June 25, 1974

Air Temp - 74 F Pavement Surface Temp - 88 F

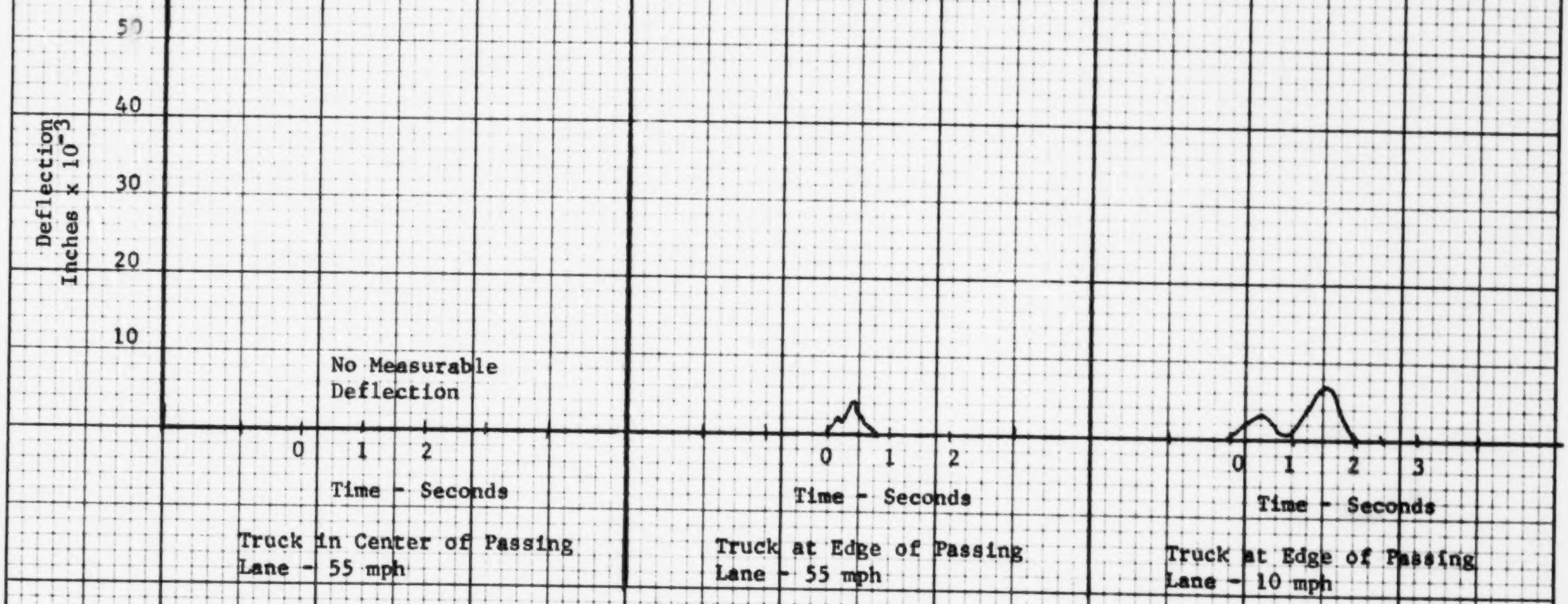
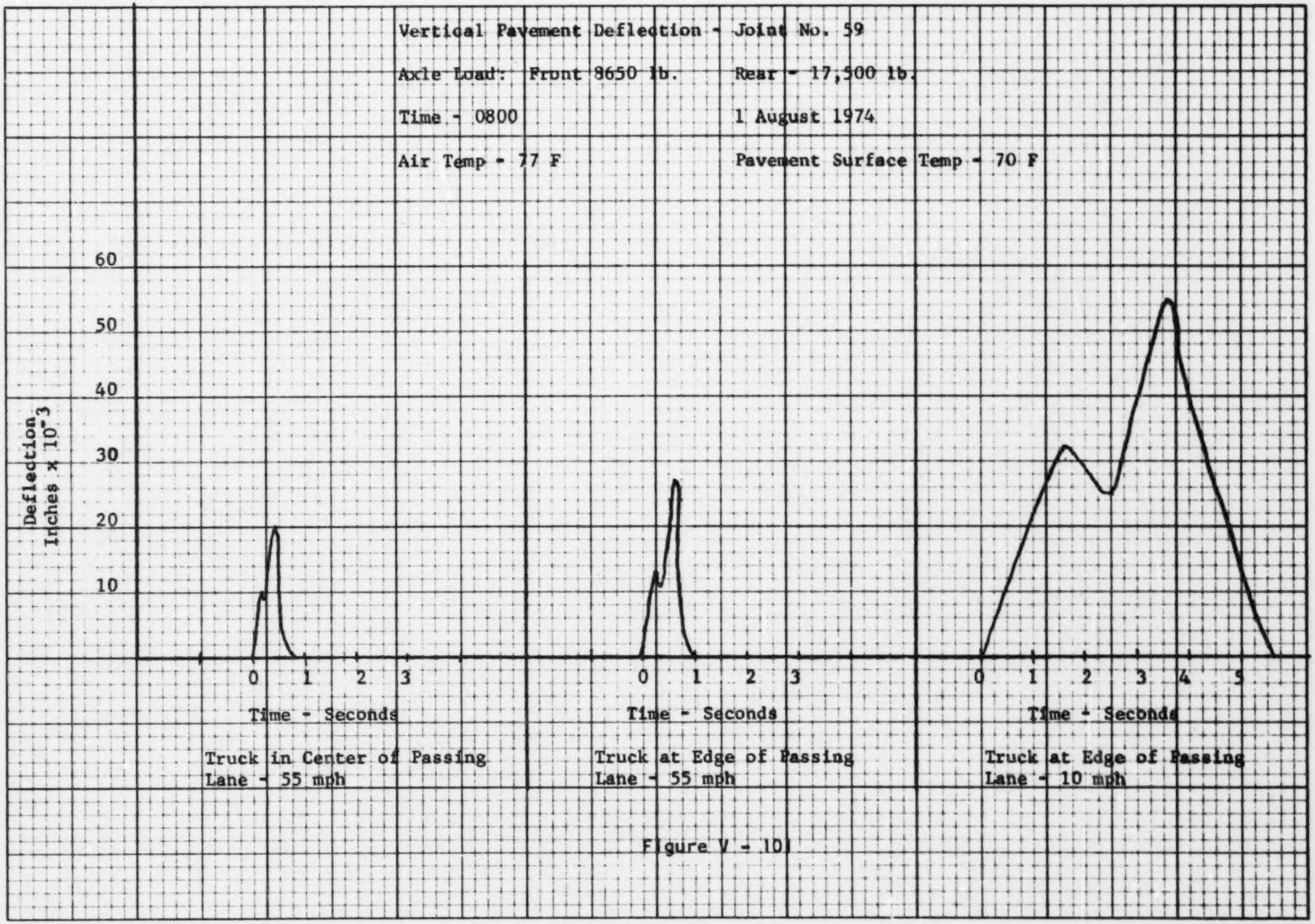


Figure V - 100

K•Σ 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 0780



Vertical Pavement Deflection - Joint No. 59

Axle Load: Front 8650 lb. Rear - 17,500 lb.

Time - 0800

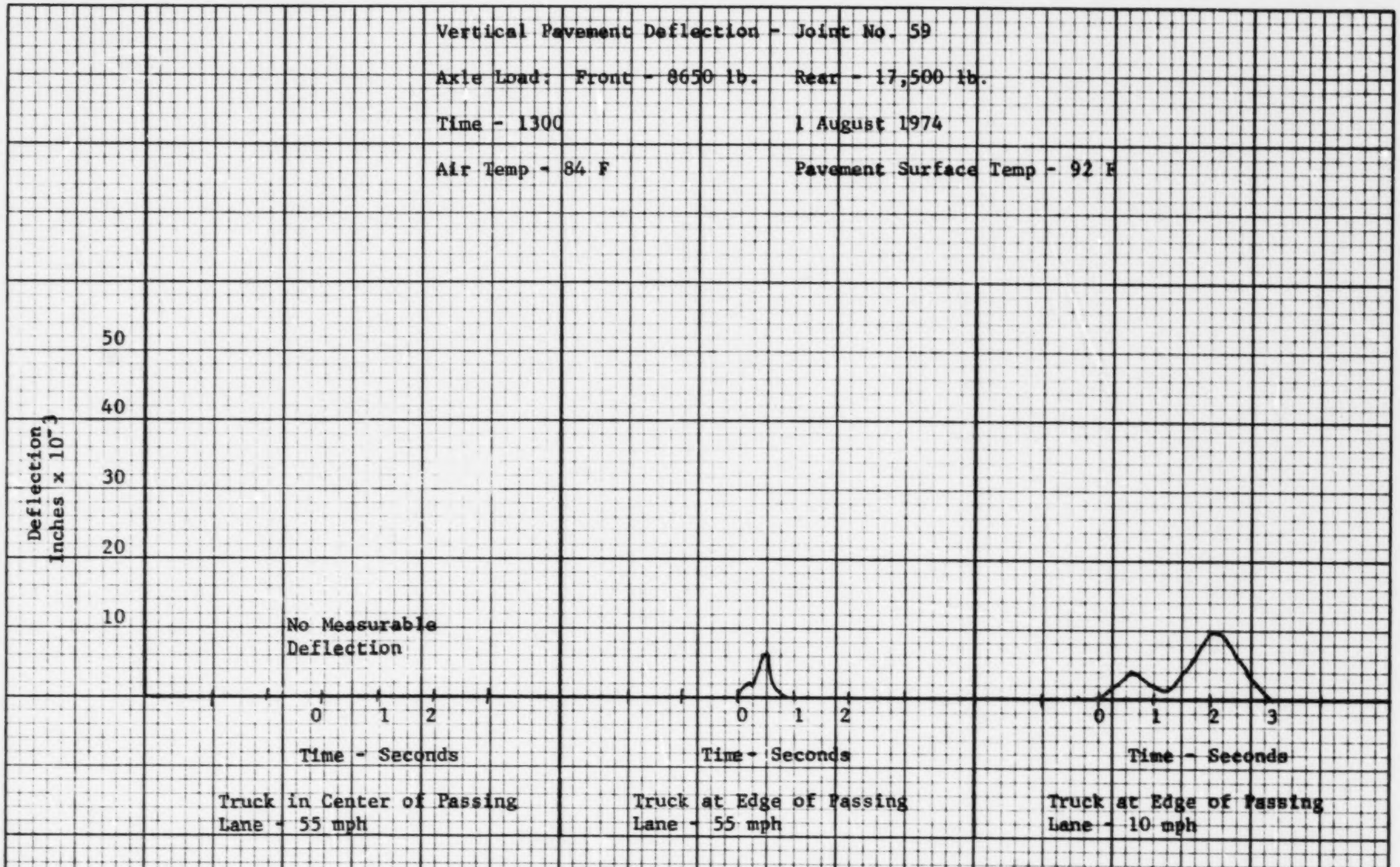
1 August 1974

Air Temp - 77 F

Pavement Surface Temp - 70 F

Figure V - 10

K•E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 0780

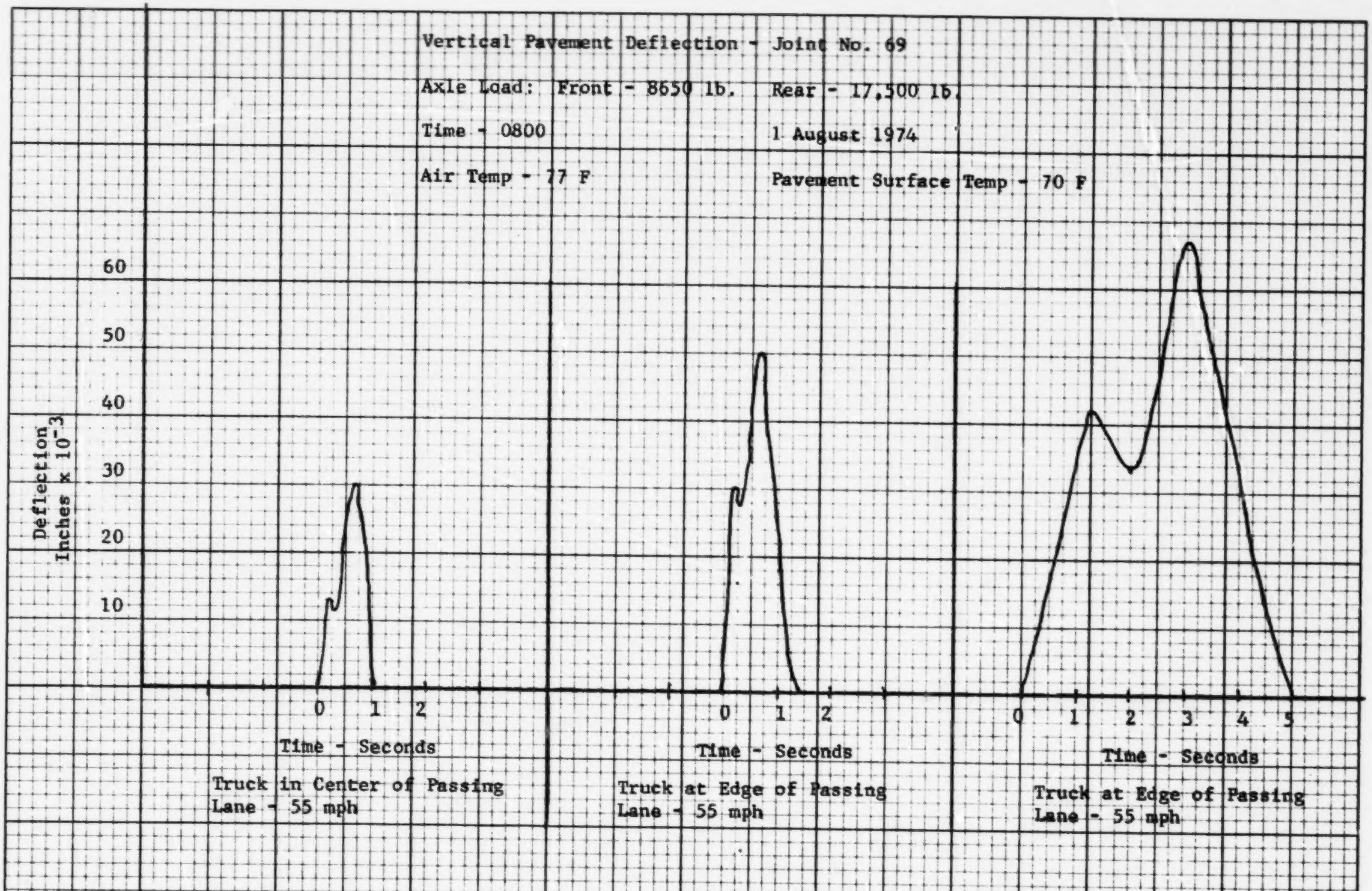


Vertical Pavement Deflection - Joint No. 59
Axle Load: Front - 8650 lb. Rear - 17,500 lb.
Time - 1300 1 August 1974
Air Temp - 84 F Pavement Surface Temp - 92 F

Figure V - 102

K•E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 0780



Vertical Pavement Deflection - Joint No. 69

Axle Load: Front - 8650 lb. Rear - 17,500 lb.

Time - 0800

1 August 1974

Air Temp - 77 F

Pavement Surface Temp - 70 F

Figure V - 103

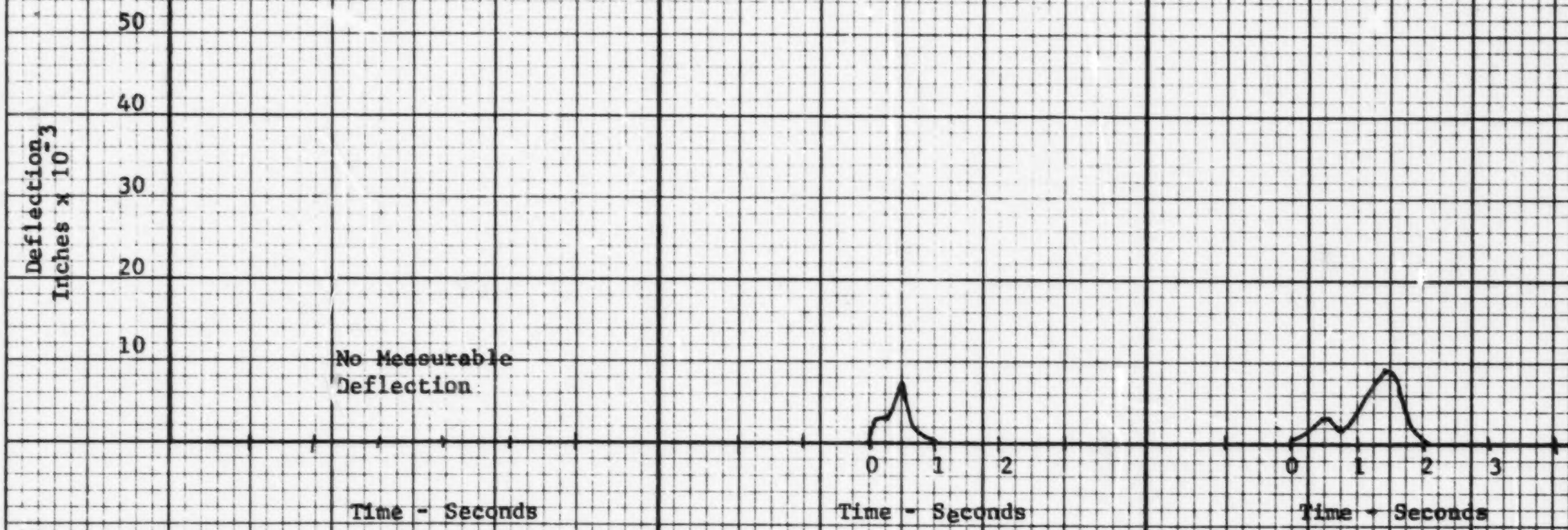
K•E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 0780

Vertical Pavement Deflection - Joint No. 69

Axle Load: Front - 8650 lb. Rear - 17,500 lb.

Time - 1300 1 August 1974

Air Temp - 84 F Pavement Surface Temp - 92 F



Truck in Center of Passing Lane - 55 mph

Truck at Edge of Passing Lane - 55 mph

Truck at Edge of Passing Lane - 55 mph

Figure V - 104

K•E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 0780

Vertical Pavement Deflection - Joint No. 78

Axle Load: Front - 8650 lb. Rear - 17,500 lb.

Time - 0800 1 August 1974

Air Temp - 77 F Pavement Surface Temp - 70 F

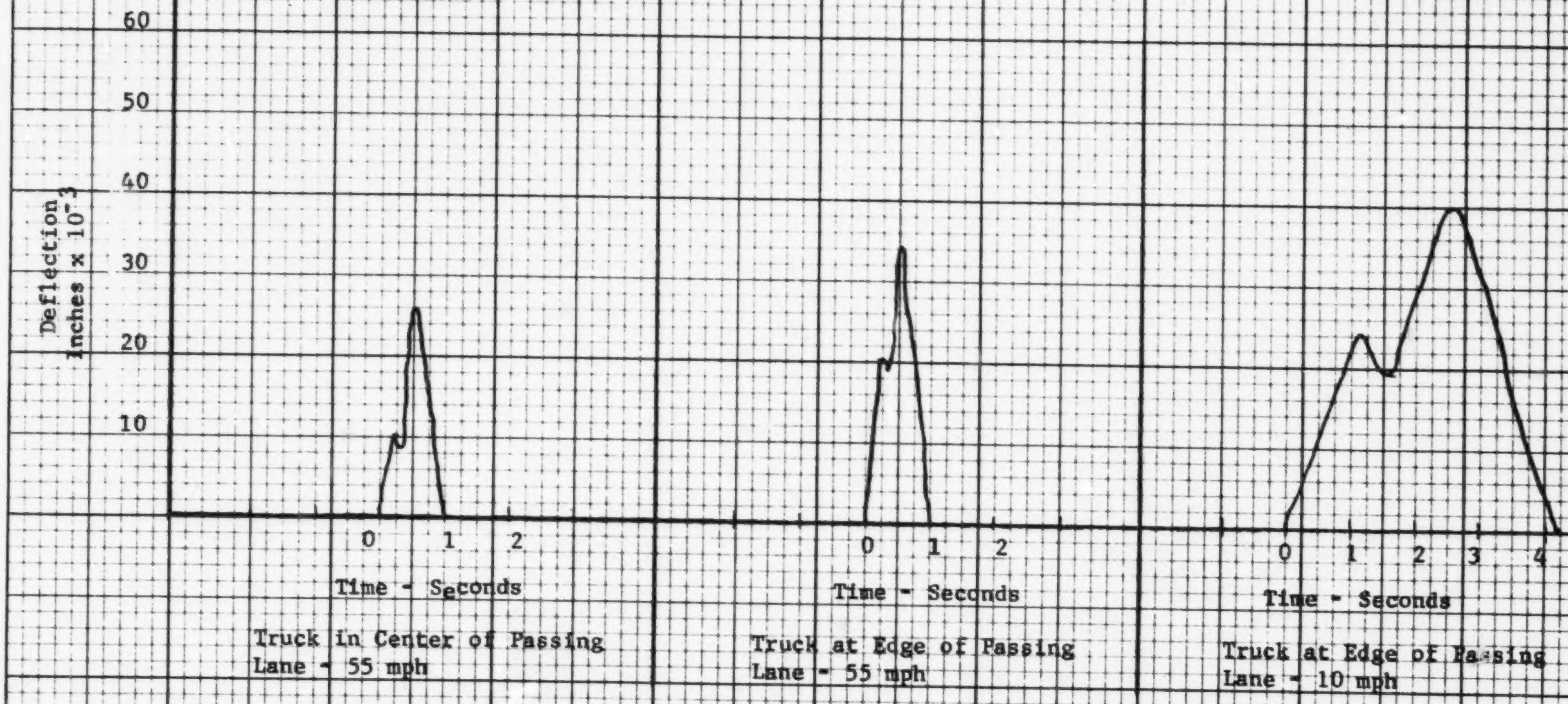


Figure V - 105

K•E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.

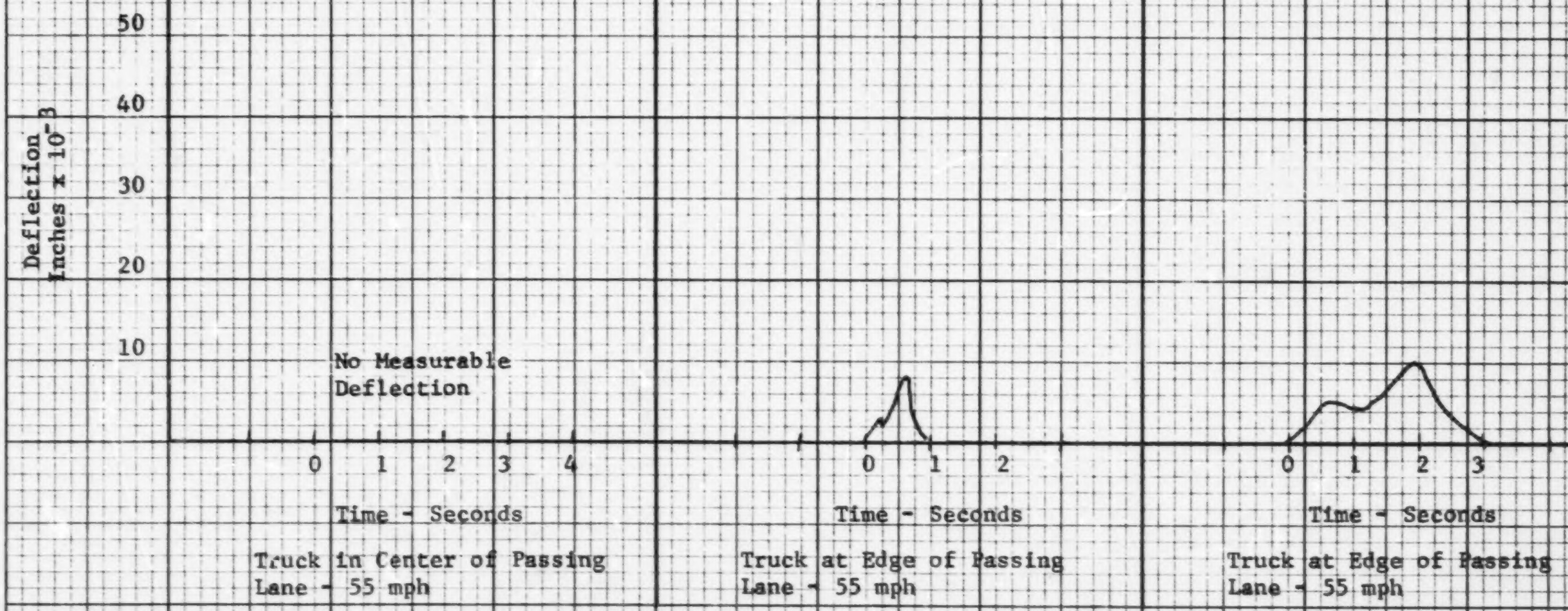
46 0780

Vertical Pavement Deflection - Joint No. 7B

Axle Load: Front - 8650 lb. Rear - 17,500 lb.

Time - 1300 1 August 1974

Air Temp - 84 F Pavement Surface Temp - 92 F



Truck in Center of Passing Lane - 55 mph

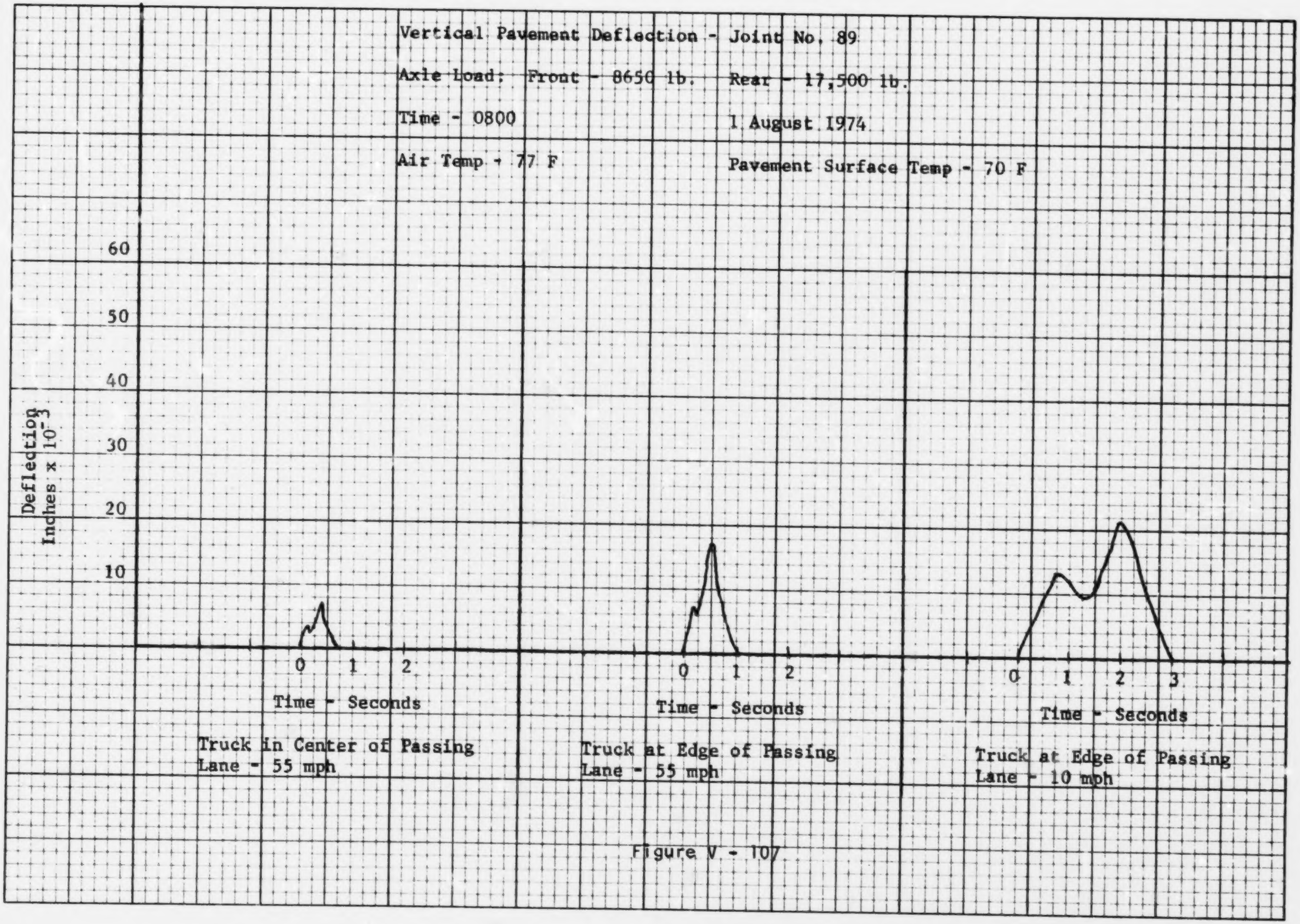
Truck at Edge of Passing Lane - 55 mph

Truck at Edge of Passing Lane - 55 mph

Figure V - 106

K•E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 0780



Vertical Pavement Deflection - Joint No. 89

Axle Load: Front - 8650 lb. Rear - 17,500 lb.

Time - 0800

1 August 1974

Air Temp - 77 F

Pavement Surface Temp - 70 F

Figure V - 107

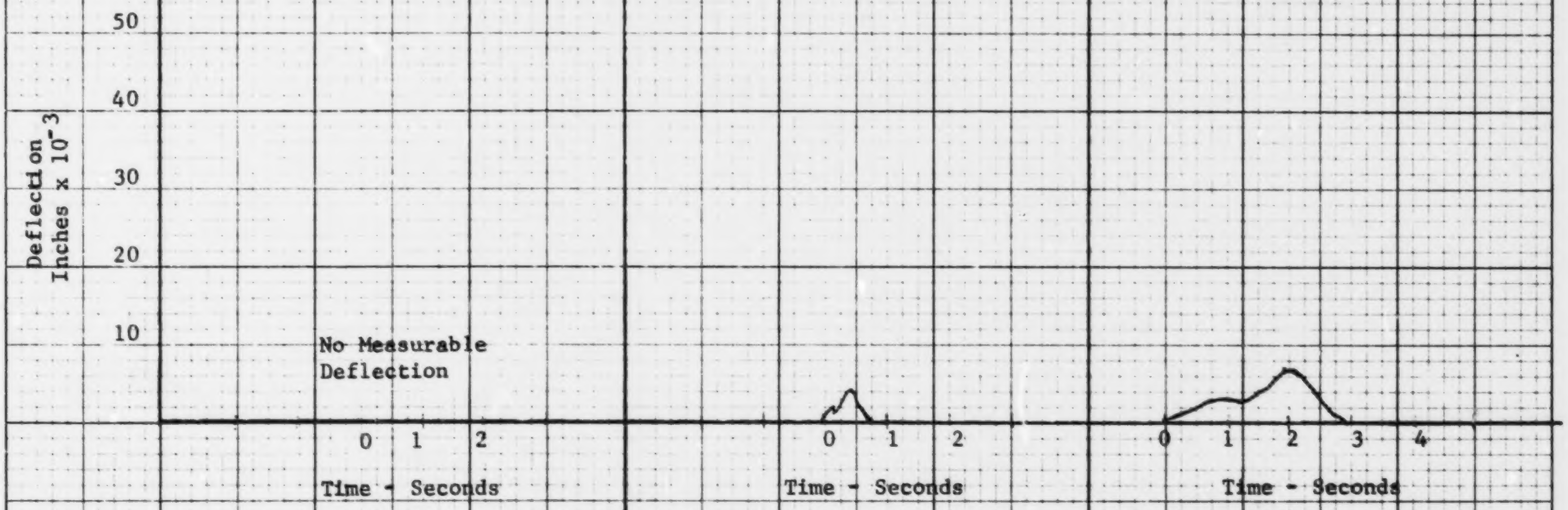
K•E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 0780

Vertical Pavement Deflection - Joint No. 89

Axle Load: Front - 8650 lb. Rear - 17,500 lb.

Time - 1300
1 August 1974

Air Temp - 84 F
Pavement Surface Temp - 92 F



Truck in Center of Passing Lane - 55 mph

Truck at Edge of Passing Lane - 55 mph

Truck at Edge of Passing Lane - 10 mph

Figure V - 108

46 0780

PAVEMENT CRACKING & SPALLING Sept. 4, 1974

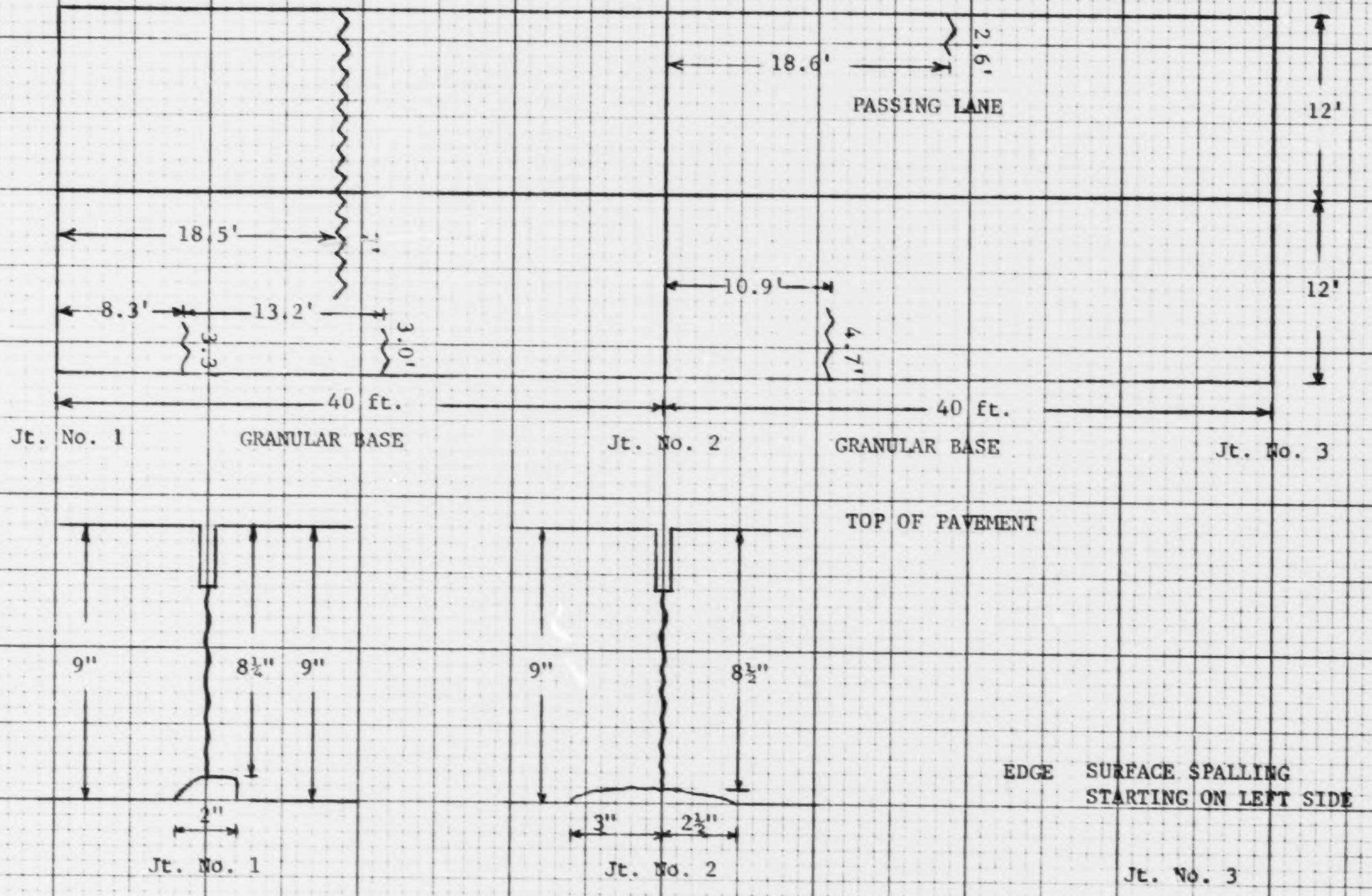

2.6'
18.6'
PASSING LANE
12'
18.5'
10.9'
12'
8.3'
13.2'
3.3'
3.0'
4.7'
40 ft.
40 ft.
Jt. No. 1
GRANULAR BASE
Jt. No. 2
GRANULAR BASE
Jt. No. 3
TOP OF PAVEMENT
9"
8¼"
9"
9"
8½"
2"
3"
2¼"
EDGE
SURFACE SPALLING
STARTING ON LEFT SIDE
Jt. No. 1
Jt. No. 2
Jt. No. 3

FIGURE V-109

K•E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 0780

PAVEMENT CRACKING & SPALLING Sept. 4, 1974

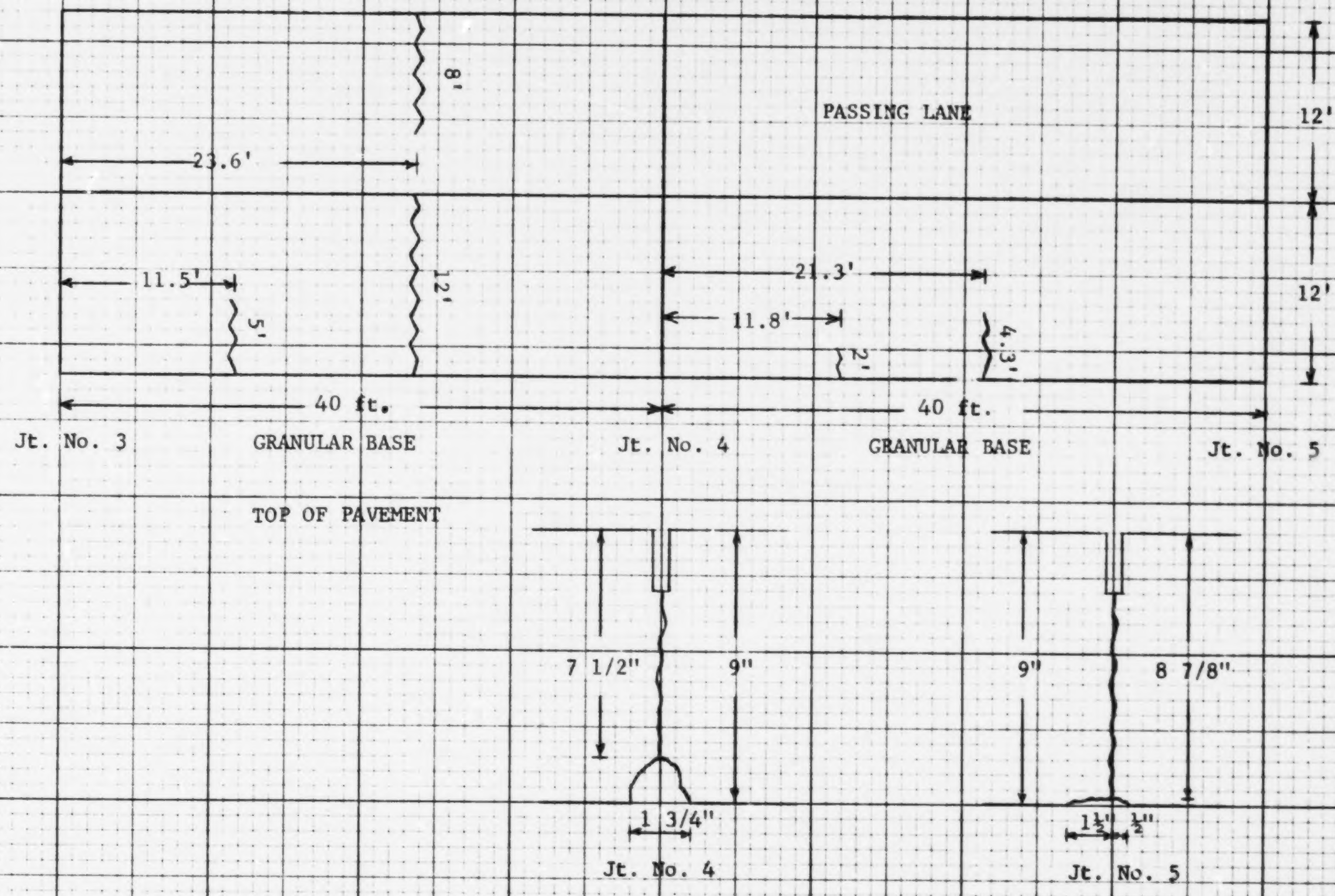

PASSING LANE
12'
12'
8'
23.6'
12'
11.5'
5'
21.3'
11.8'
2'
4.3'
40 ft.
40 ft.
Jt. No. 3
GRANULAR BASE
Jt. No. 4
GRANULAR BASE
Jt. No. 5
TOP OF PAVEMENT
7 1/2"
9"
1 3/4"
Jt. No. 4
9"
8 7/8"
1½"
½"
Jt. No. 5

FIGURE V - 110

K+E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 0780

PAVEMENT CRACKING & SPALLING Sept. 4, 1974

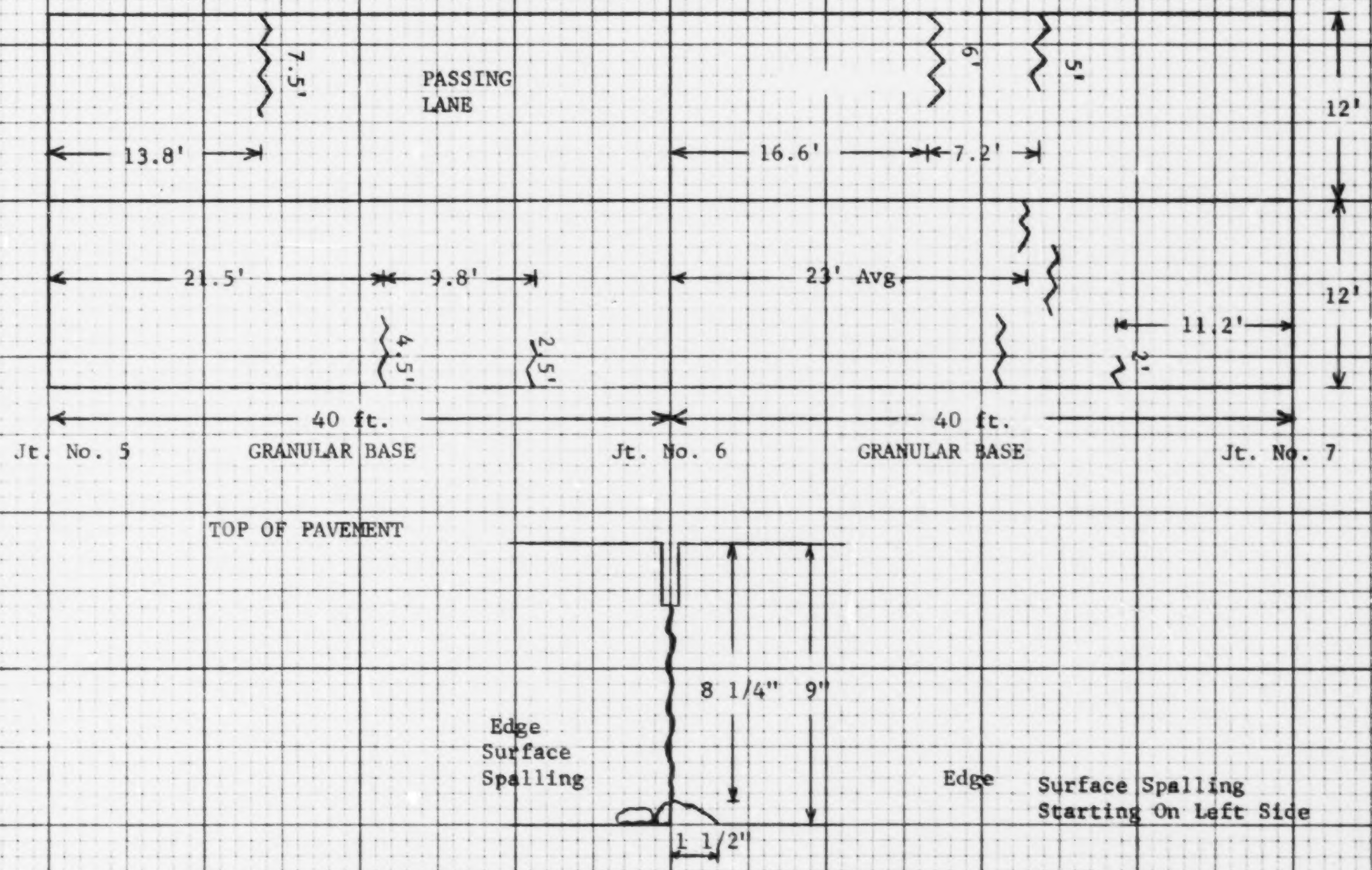

7.5'
PASSING LANE
6'
5'
12'
13.8'
16.6'
7.2'
21.5'
9.8'
23' Avg.
12'
11.2'
4.5'
2.5'
2'
40 ft.
40 ft.
Jt. No. 5
GRANULAR BASE
Jt. No. 6
GRANULAR BASE
Jt. No. 7
TOP OF PAVEMENT
8 1/4"
9"
Edge Surface Spalling
Edge
Surface Spalling Starting On Left Side
1 1/2"
Jt. No. 6
Jt. No. 7

FIGURE V - 111

46 0780

PAVEMENT CRACKING & SPALLING Sept. 4, 1974

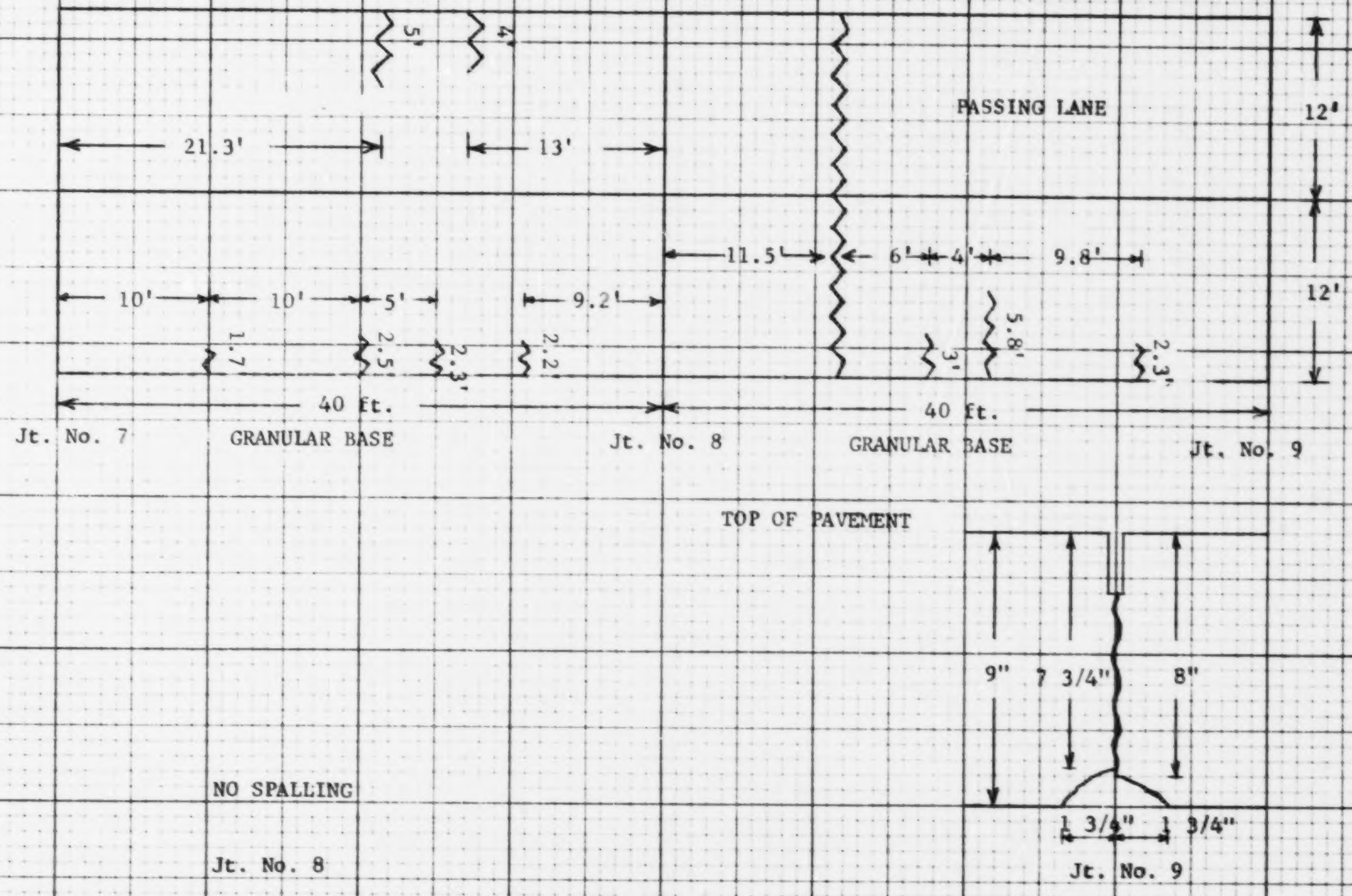

5'
4'
PASSING LANE
12'
21.3'
13'
11.5'
6'
4'
9.8'
12'
10'
10'
5'
9.2'
1.7
2.5'
2.3'
2.2'
3'
5.8'
2.3'
40 ft.
40 ft.
Jt. No. 7
GRANULAR BASE
Jt. No. 8
GRANULAR BASE
Jt. No. 9
TOP OF PAVEMENT
9"
7 3/4"
8"
1 3/4"
1 3/4"
NO SPALLING
Jt. No. 8
Jt. No. 9

FIGURE V-112

K•E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 0780

PAVEMENT CRACKING & SPALLING Sept. 4, 1974

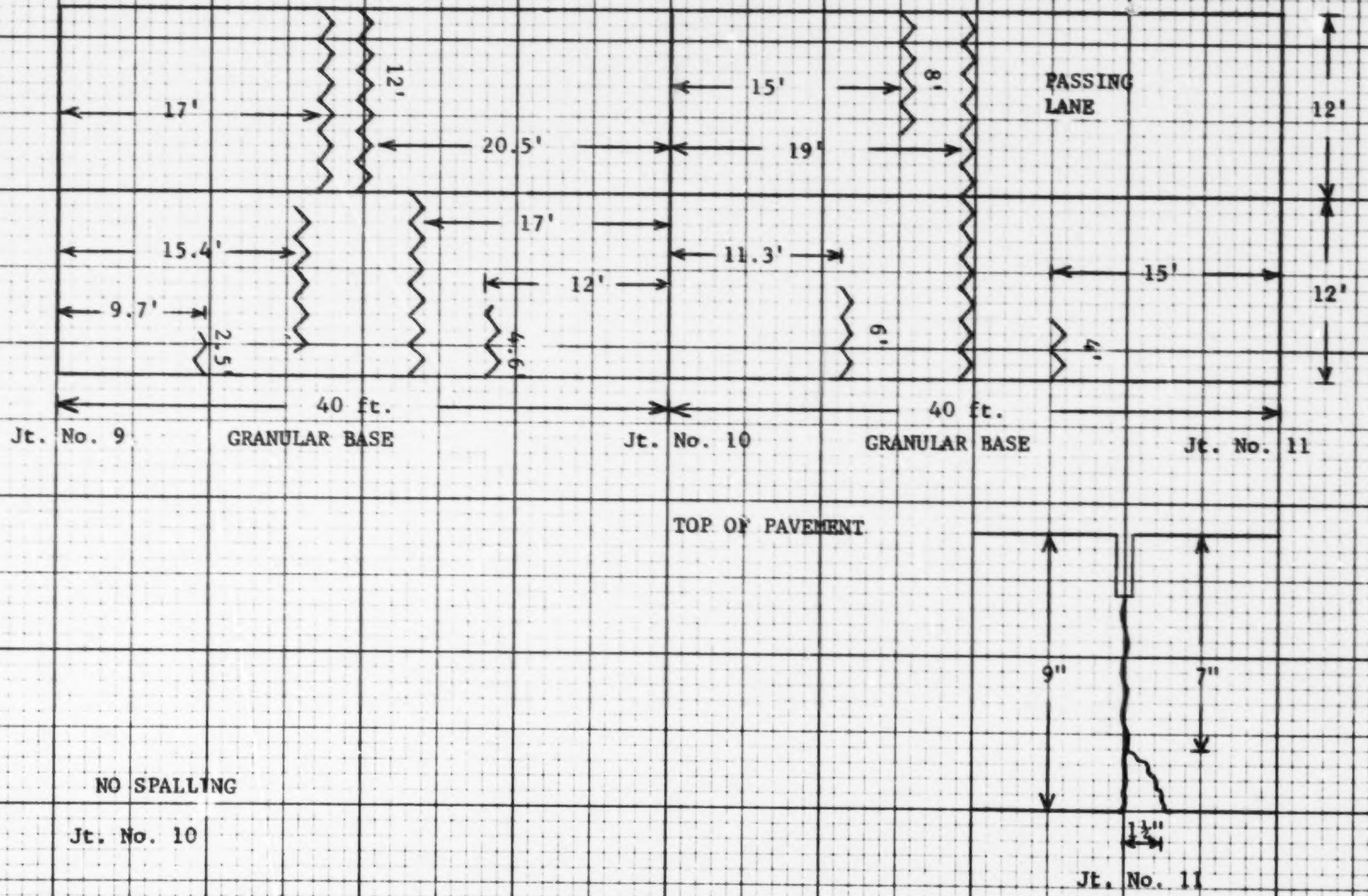

17'
12'
20.5'
15'
8'
19'
PASSING LANE
12'
17'
15.4'
11.3'
12'
9.7'
2.5'
4.6'
6'
15'
4'
12'
40 ft.
40 ft.
Jt. No. 9
GRANULAR BASE
Jt. No. 10
GRANULAR BASE
Jt. No. 11
TOP OF PAVEMENT
9"
7"
1½"
Jt. No. 11
NO SPALLING
Jt. No. 10

FIGURE V - 113

K•E 10 X 10 TO THE INCH • 7 x 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 0780

PAVEMENT CRACKING & SPALLING Sept. 4, 1974

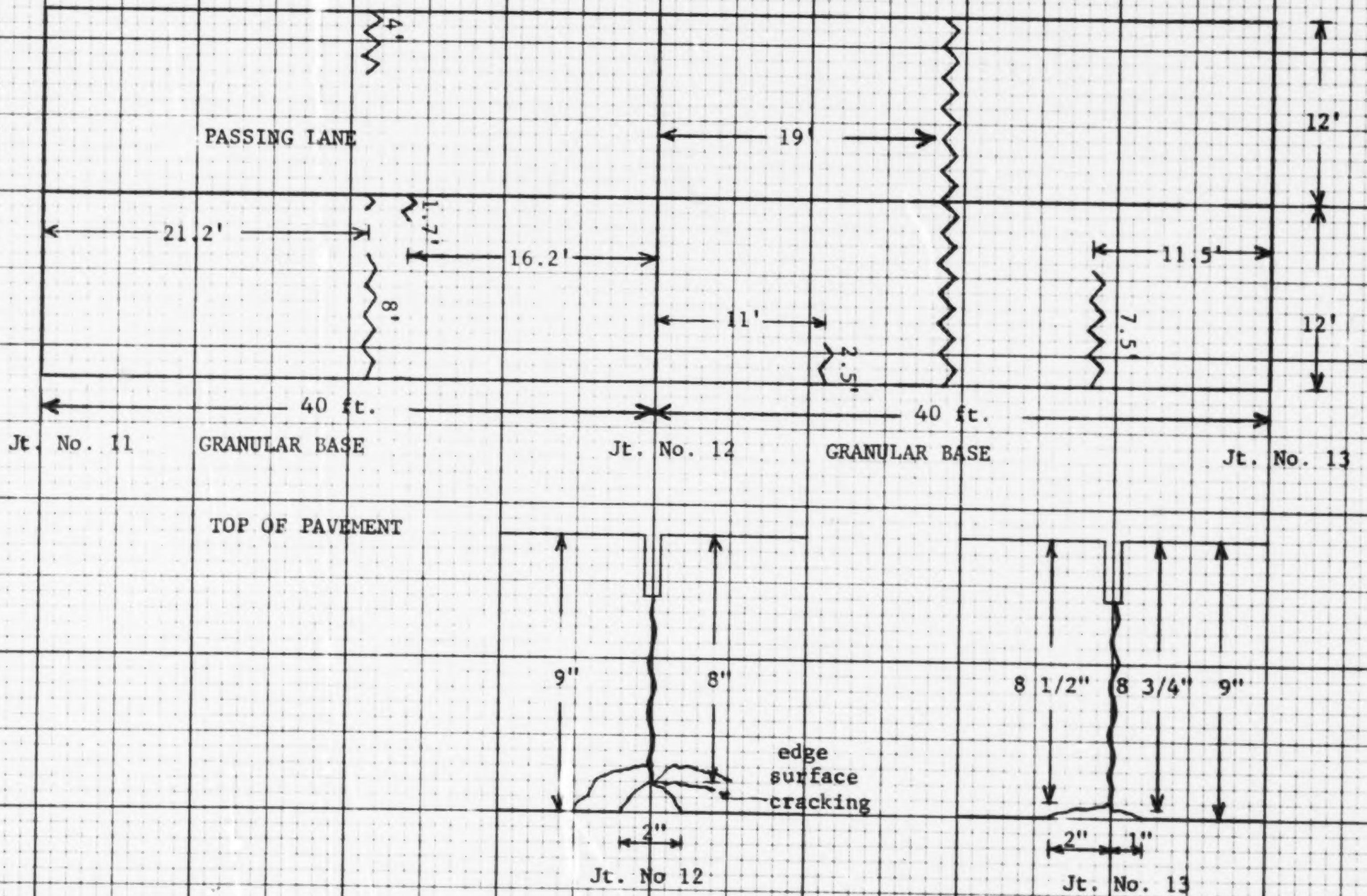

4'
PASSING LANE
19'
12'
21.2'
1.7'
16.2'
11.5'
8'
11'
7.5'
12'
2.5'
40 ft.
40 ft.
Jt. No. 11
GRANULAR BASE
Jt. No. 12
GRANULAR BASE
Jt. No. 13
TOP OF PAVEMENT
9"
8"
edge
surface
cracking
2"
Jt. No 12
8 1/2"
8 3/4"
9"
2"
1"
Jt. No. 13

FIGURE V - 114

K•E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 0780

PAVEMENT CRACKING & SPALLING Sept. 4, 1974

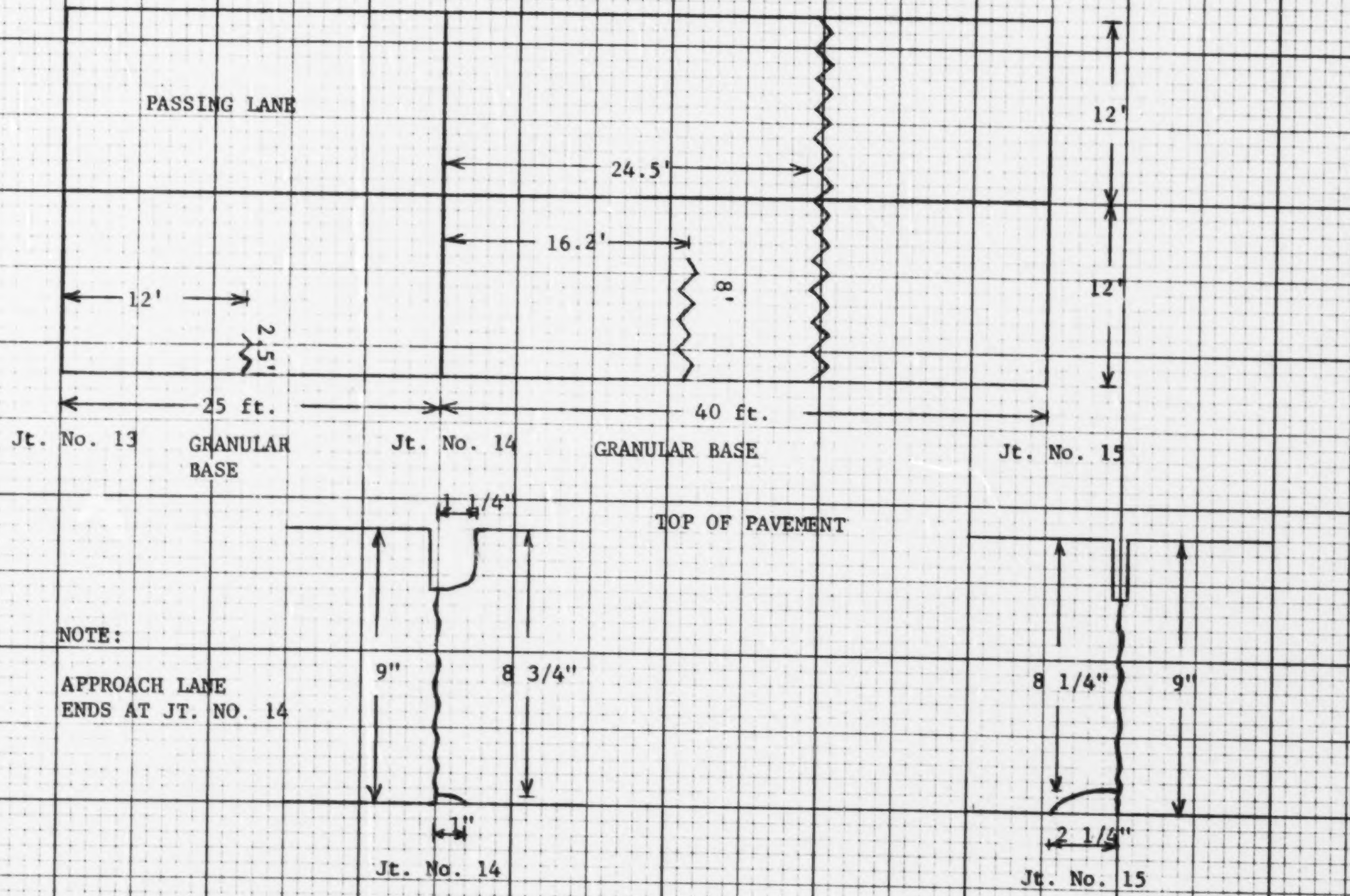

PASSING LANE
24.5'
16.2'
12'
12'
12'
8'
2.5'
25 ft.
40 ft.
Jt. No. 13
GRANULAR BASE
Jt. No. 14
GRANULAR BASE
Jt. No. 15
1 1/4"
TOP OF PAVEMENT
NOTE:
APPROACH LANE ENDS AT JT. NO. 14
9"
8 3/4"
1"
Jt. No. 14
8 1/4"
9"
2 1/4"
Jt. No. 15

FIGURE V - 115

K•E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 0780

PAVEMENT CRACKING & SPALLING Sept. 4, 1974

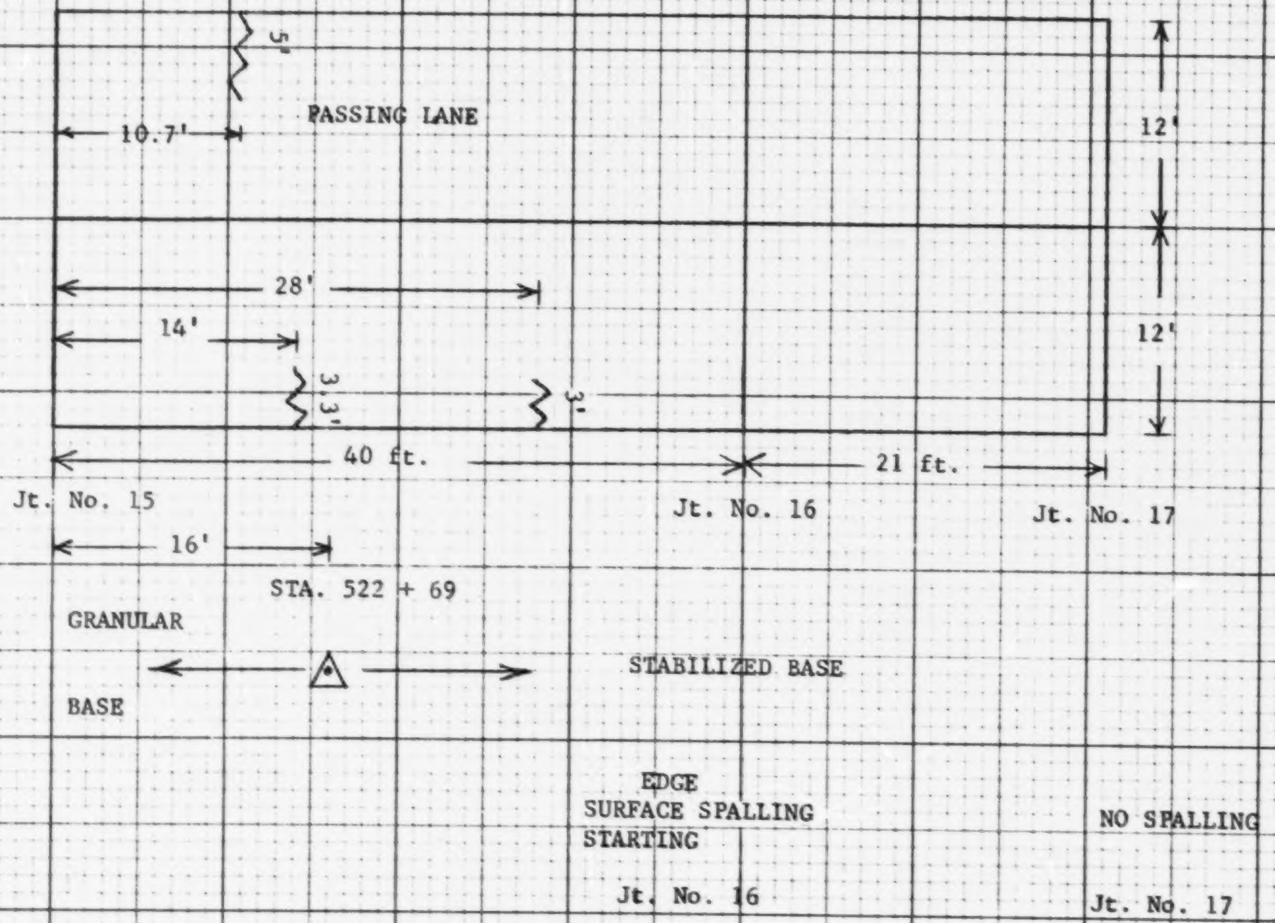

5'
PASSING LANE
10.7'
12'
12'
28'
14'
3.3'
3'
40 ft.
21 ft.
Jt. No. 15
Jt. No. 16
Jt. No. 17
16'
STA. 522 + 69
GRANULAR
BASE
STABILIZED BASE
EDGE
SURFACE SPALLING
STARTING
Jt. No. 16
NO SPALLING
Jt. No. 17

FIGURE V - 116

K•E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 0780

PAVEMENT CRACKING & SPALLING Sept. 4, 1974

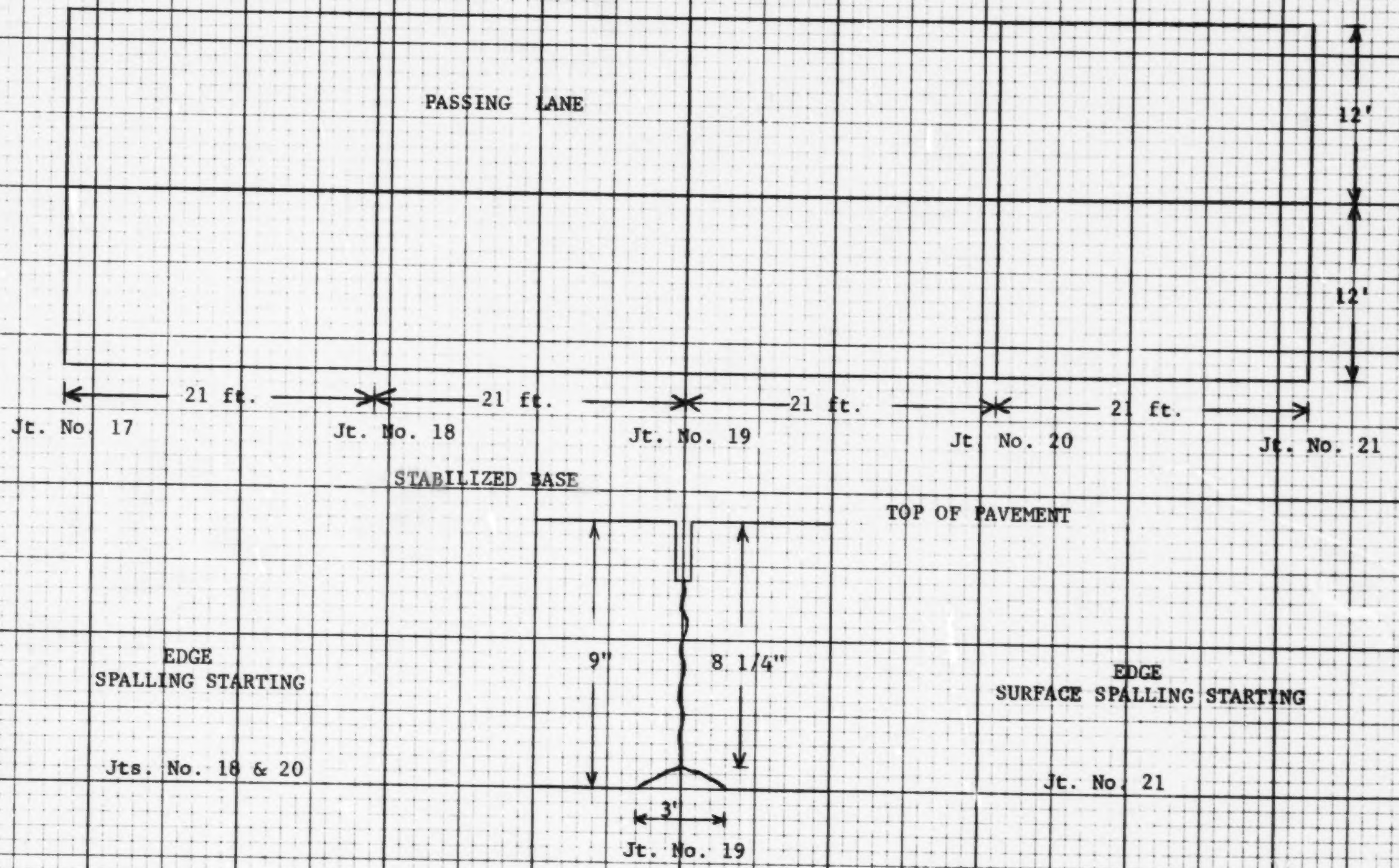

PASSING LANE
12'
12'
21 ft.
21 ft.
21 ft.
21 ft.
Jt. No. 17
Jt. No. 18
Jt. No. 19
Jt. No. 20
Jt. No. 21
STABILIZED BASE
TOP OF PAVEMENT
9"
8 1/4"
3"
EDGE
SPALLING STARTING
Jts. No. 18 & 20
EDGE
SURFACE SPALLING STARTING
Jt. No. 21
Jt. No. 19

FIGURE V - 117

K•E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 0780

PAVEMENT CRACKING & SPALLING Sept. 4, 1974

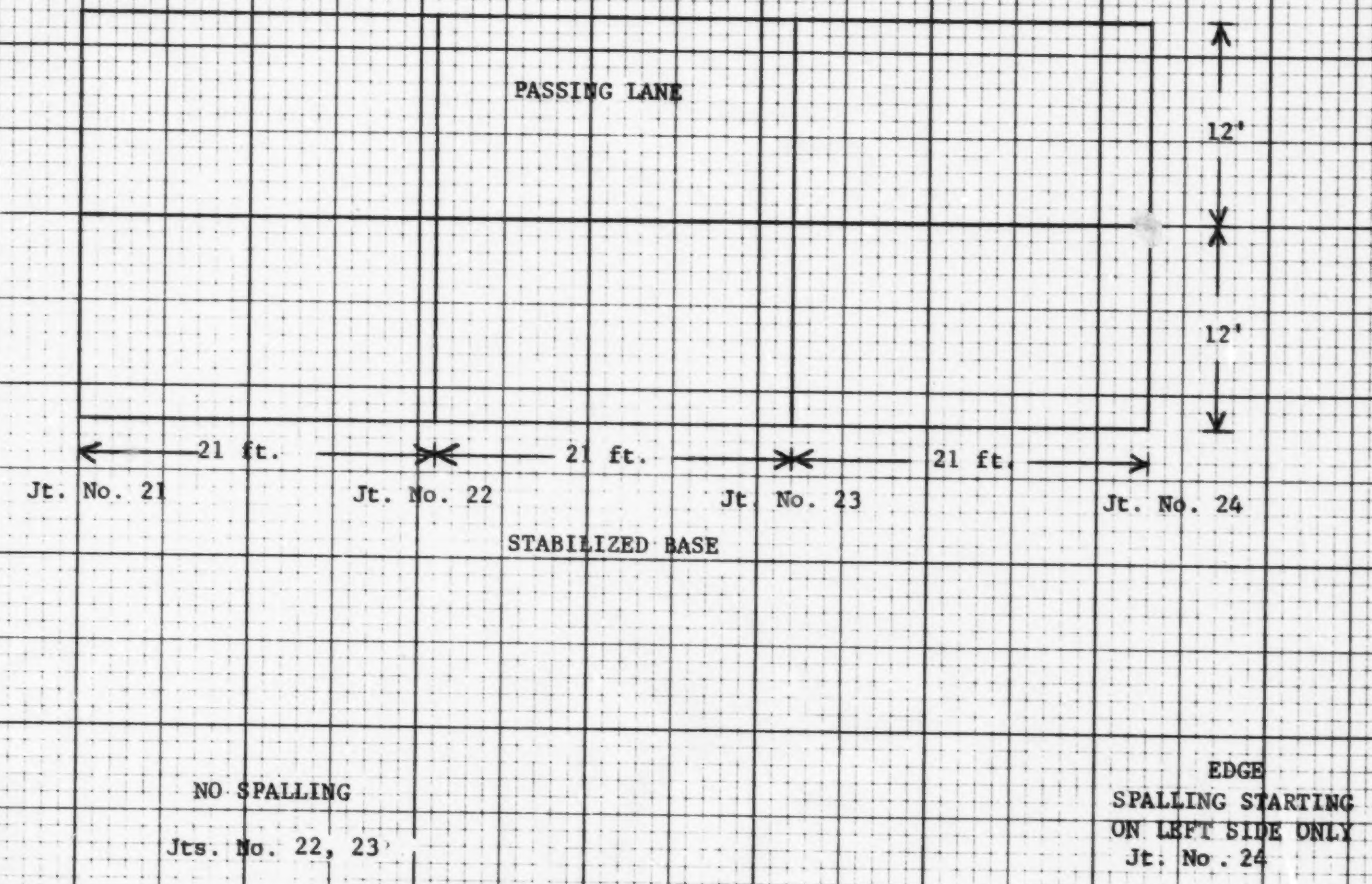

PASSING LANE
12'
12'
21 ft.
21 ft.
21 ft.
Jt. No. 21
Jt. No. 22
Jt. No. 23
Jt. No. 24
STABILIZED BASE
NO SPALLING
Jts. No. 22, 23
EDGE
SPALLING STARTING
ON LEFT SIDE ONLY
Jt. No. 24

FIGURE V-118

K+E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 0780

PAVEMENT CRACKING & SPALLING Sept. 4, 1974

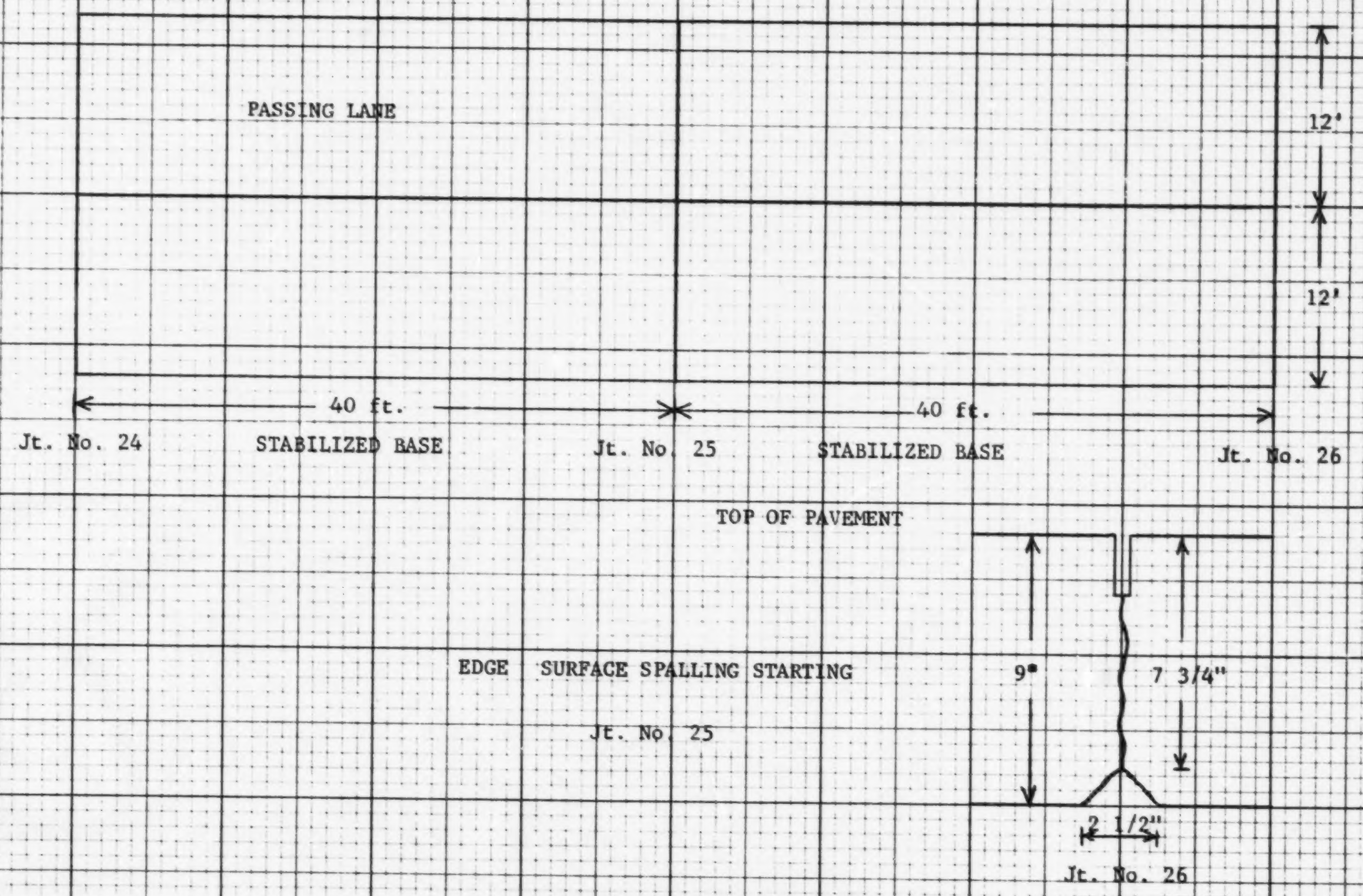

PASSING LANE
12'
12'
40 ft.
40 ft.
Jt. No. 24
STABILIZED BASE
Jt. No. 25
STABILIZED BASE
Jt. No. 26
TOP OF PAVEMENT
EDGE SURFACE SPALLING STARTING
Jt. No. 25
9"
7 3/4"
2 1/2"
Jt. No. 26

FIGURE V - 119

K•E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 0780

PAVEMENT CRACKING & SPALLING Sept. 4, 1974

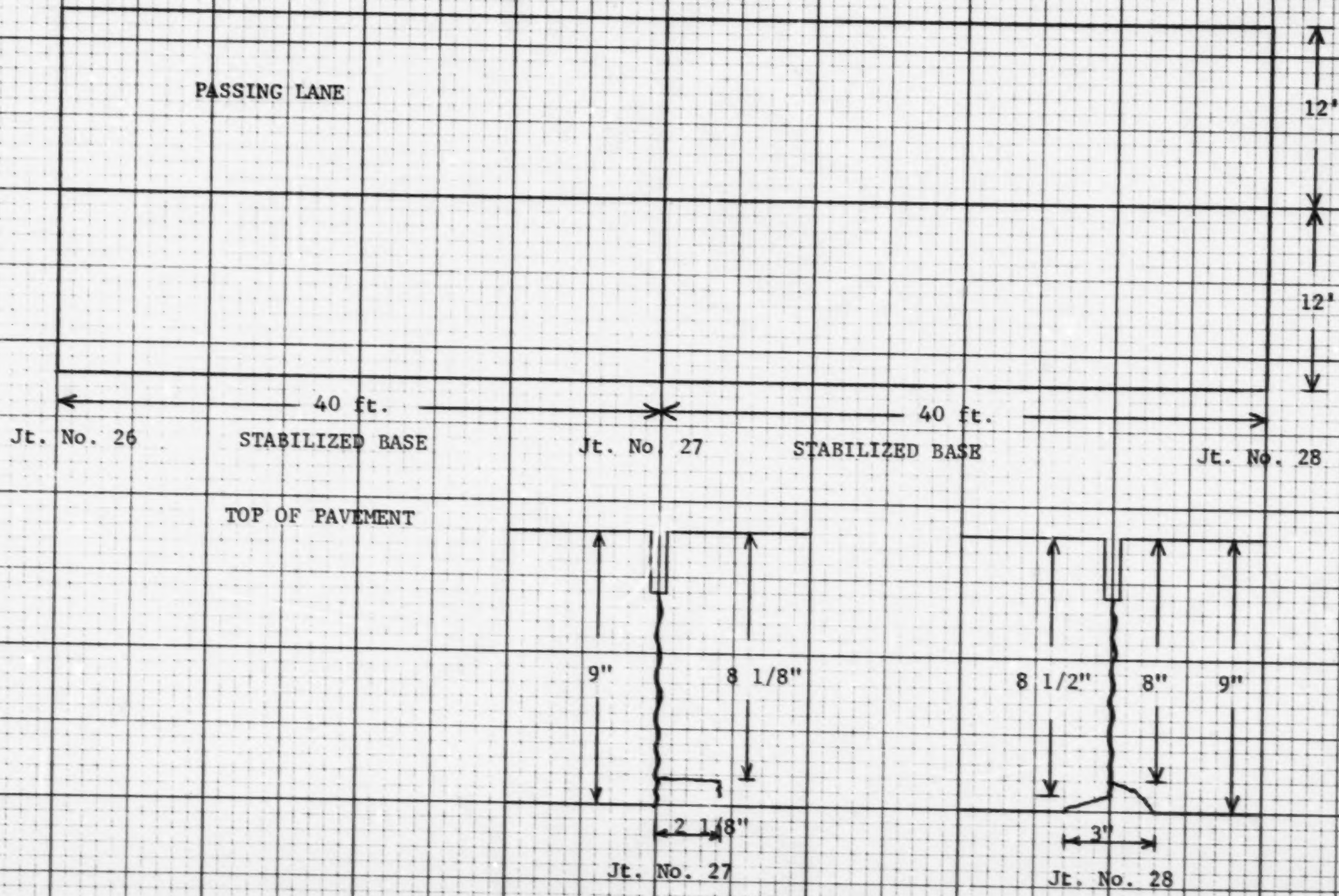

PASSING LANE
12'
12'
40 ft.
40 ft.
Jt. No. 26
STABILIZED BASE
Jt. No. 27
STABILIZED BASE
Jt. No. 28
TOP OF PAVEMENT
9"
8 1/8"
2 1/8"
Jt. No. 27
8 1/2"
8"
9"
3"
Jt. No. 28

FIGURE V - 120

K&E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 0780

PAVEMENT CRACKING & SPALLING Sept. 4, 1974

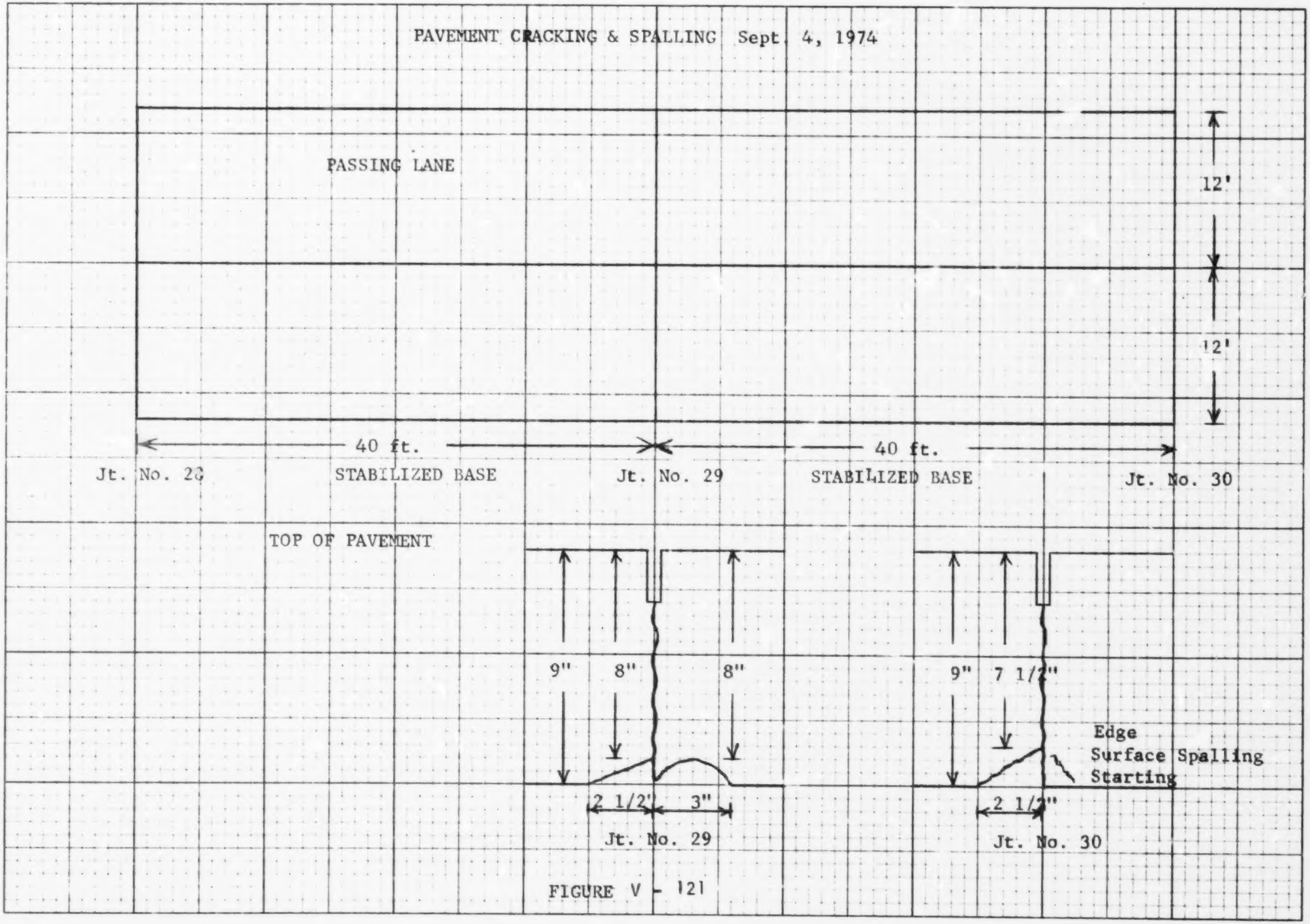

PASSING LANE
12'
12'
40 ft.
40 ft.
Jt. No. 28
STABILIZED BASE
Jt. No. 29
STABILIZED BASE
Jt. No. 30
TOP OF PAVEMENT
9"
8"
8"
2 1/2"
3"
Jt. No. 29
9"
7 1/2"
Edge
Surface Spalling
Starting
2 1/2"
Jt. No. 30

FIGURE V - 121

K•E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 0780

PAVEMENT CRACKING & SPALLING Sept. 4, 1974

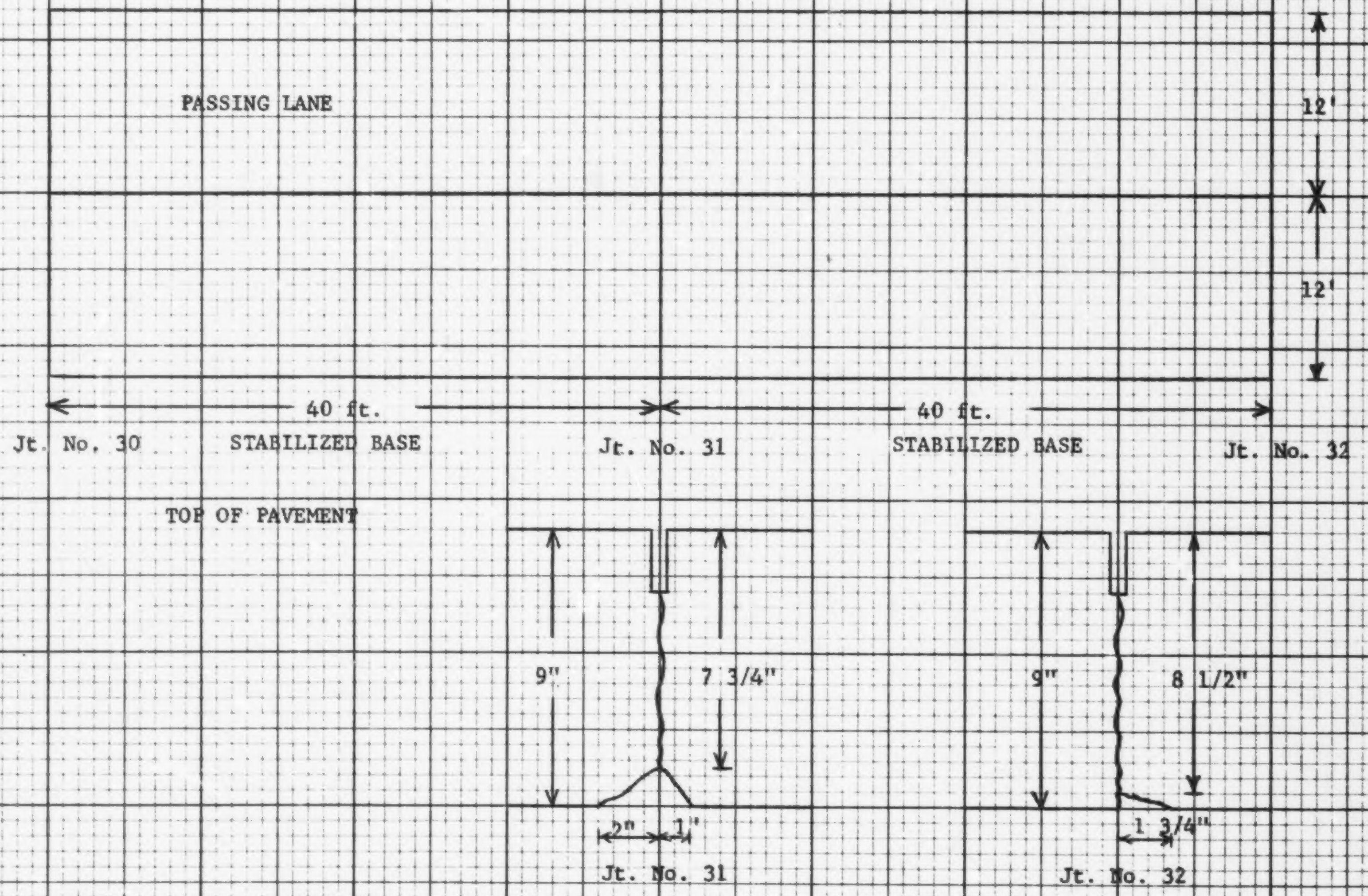

PASSING LANE
12'
12'
40 ft.
40 ft.
Jt. No. 30
STABILIZED BASE
Jt. No. 31
STABILIZED BASE
Jt. No. 32
TOP OF PAVEMENT
9"
7 3/4"
2"
1"
Jt. No. 31
9"
8 1/2"
1 3/4"
Jt. No. 32

FIGURE V - 122

K&E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 0780

PAVEMENT CRACKING & SPALLING Sept. 4, 1974

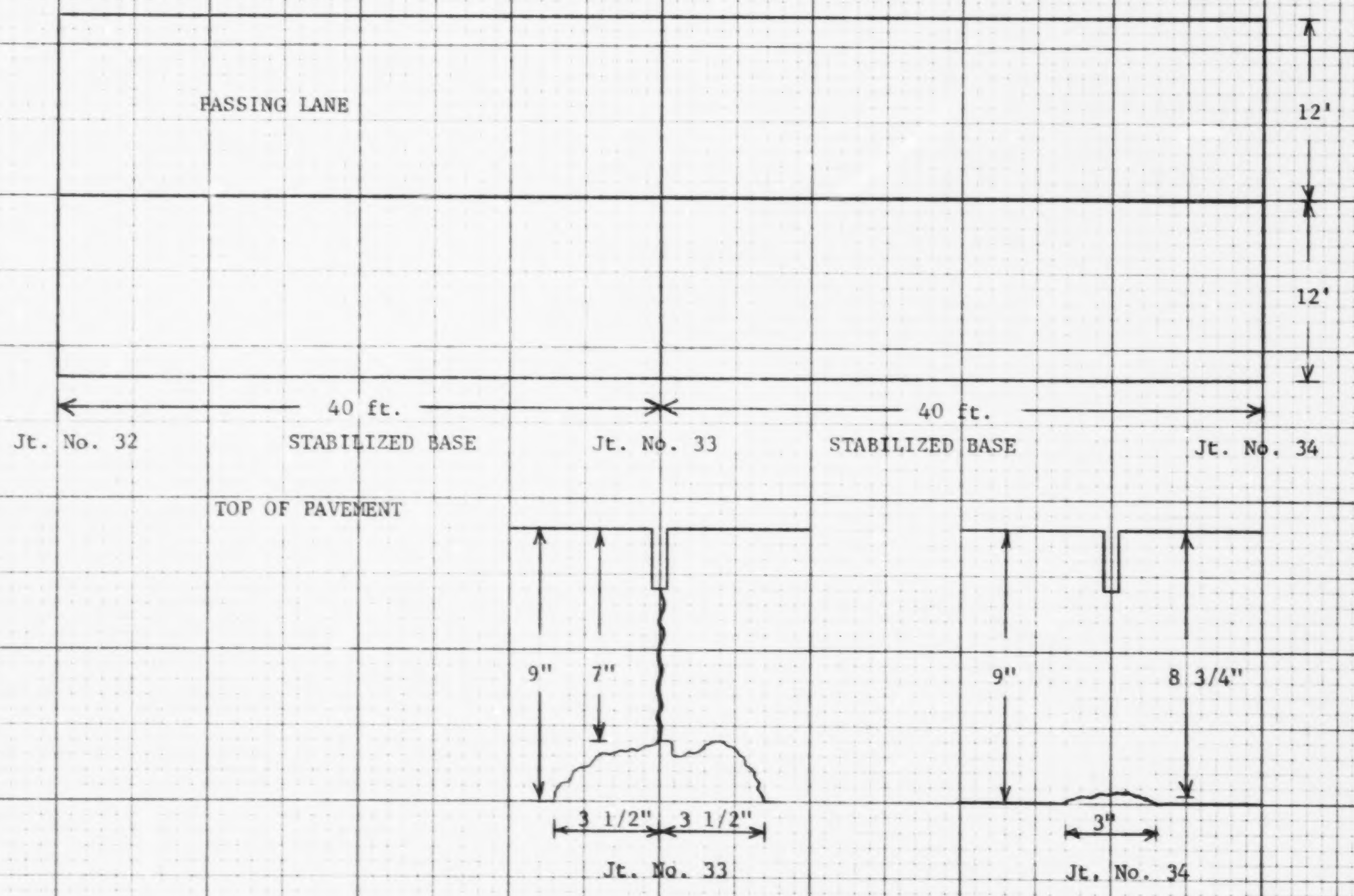

PASSING LANE
12'
12'
40 ft.
40 ft.
Jt. No. 32
STABILIZED BASE
Jt. No. 33
STABILIZED BASE
Jt. No. 34
TOP OF PAVEMENT
9"
7"
3 1/2"
3 1/2"
Jt. No. 33
9"
8 3/4"
3"
Jt. No. 34

FIGURE V - 123

K+E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 0780

PAVEMENT CRACKING & SPALLING Sept. 4, 1974

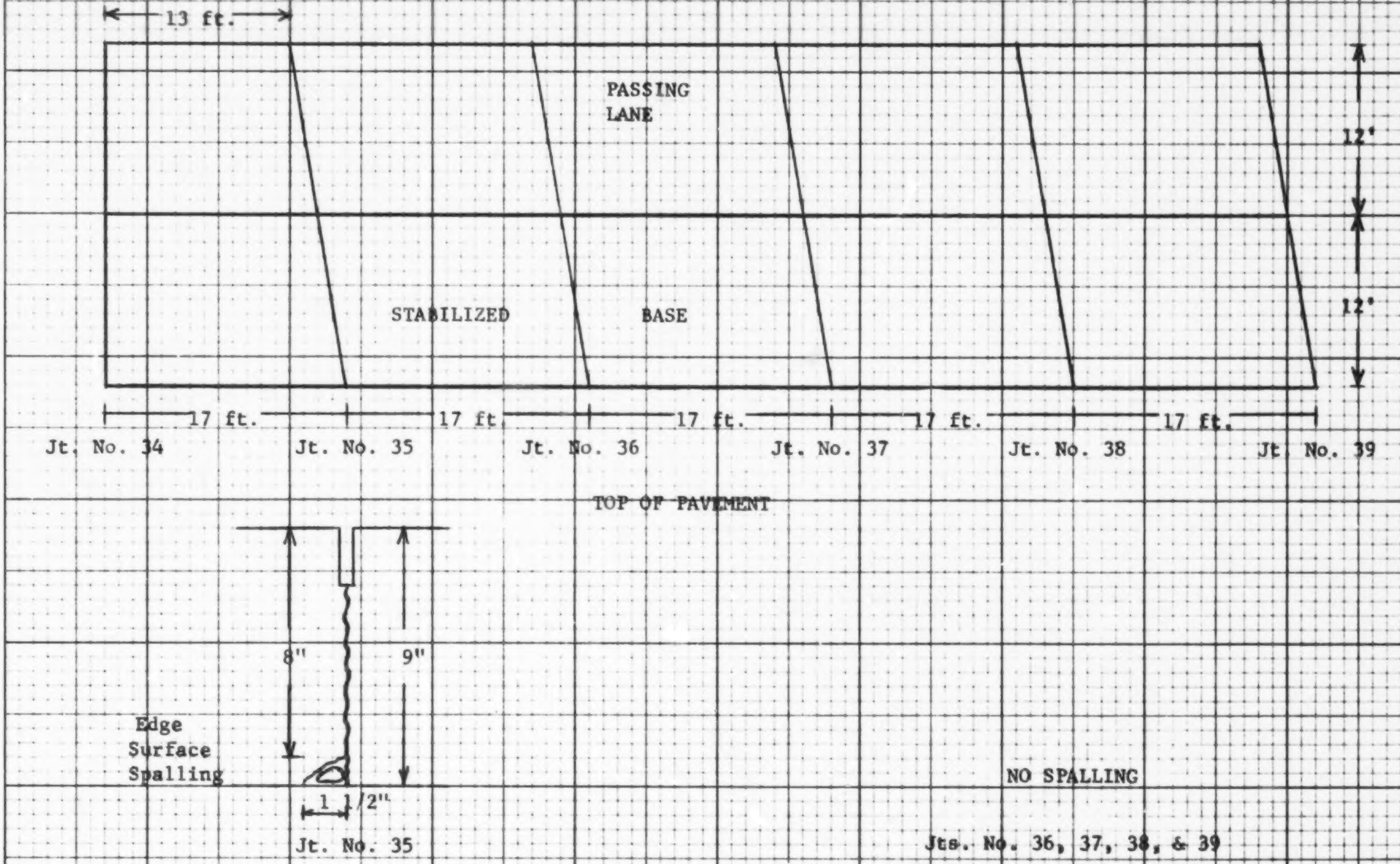

13 ft.
PASSING
LANE
STABILIZED
BASE
12'
12'
17 ft.
17 ft.
17 ft.
17 ft.
17 ft.
Jt. No. 34
Jt. No. 35
Jt. No. 36
Jt. No. 37
Jt. No. 38
Jt. No. 39
TOP OF PAVEMENT
8"
9"
Edge
Surface
Spalling
1 1/2"
Jt. No. 35
NO SPALLING
Jts. No. 36, 37, 38, & 39

FIGURE V - 124

K•E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 0780

PAVEMENT CRACKING & SPALLING Sept. 4, 1974

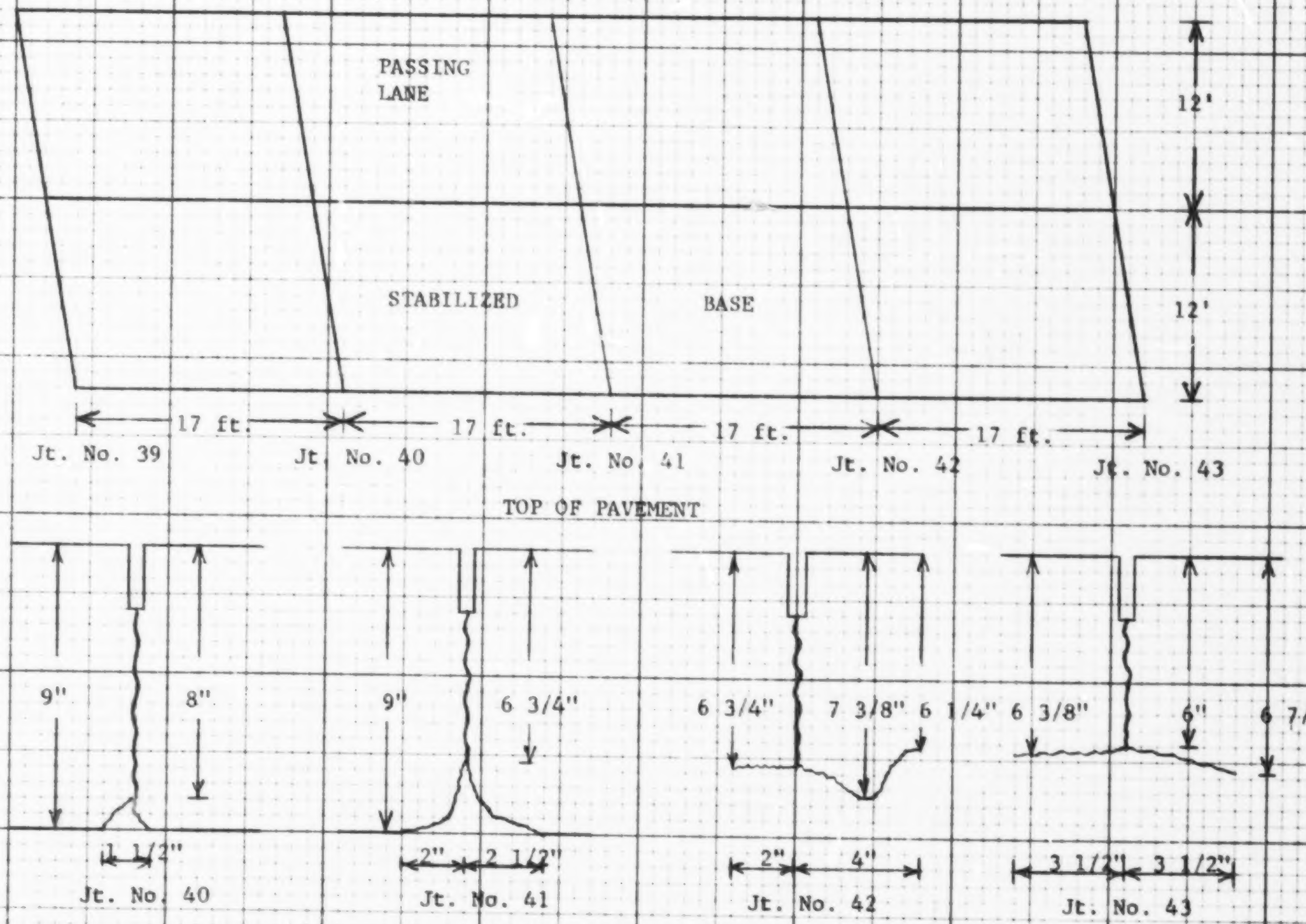

PASSING
LANE
STABILIZED
BASE
12'
12'
17 ft.
17 ft.
17 ft.
17 ft.
Jt. No. 39
Jt. No. 40
Jt. No. 41
Jt. No. 42
Jt. No. 43
TOP OF PAVEMENT
9"
8"
1 1/2"
Jt. No. 40
9"
6 3/4"
2"
2 1/2"
Jt. No. 41
6 3/4"
7 3/8"
6 1/4"
2"
4"
Jt. No. 42
6 3/8"
6"
6 7/8"
3 1/2"
3 1/2"
Jt. No. 43

FIGURE V - 125

K+E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 0780

PAVEMENT CRACKING & SPALLING Sept. 4, 1974

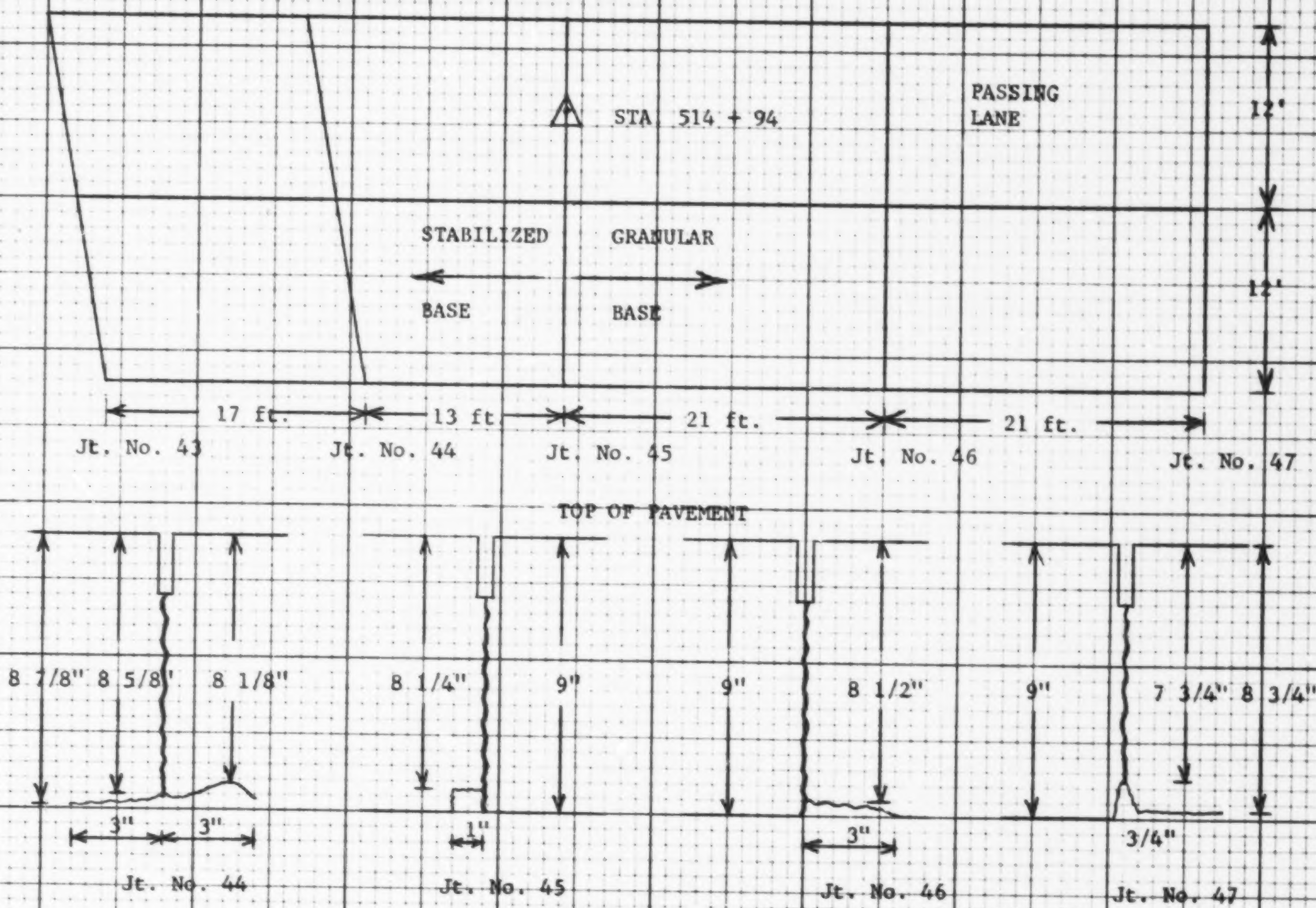

STA 514 + 94
PASSING LANE
12'
12'
STABILIZED BASE
GRANULAR BASE
17 ft.
13 ft
21 ft.
21 ft.
Jt. No. 43
Jt. No. 44
Jt. No. 45
Jt. No. 46
Jt. No. 47
TOP OF PAVEMENT
8 7/8"
8 5/8"
8 1/8"
3"
3"
Jt. No. 44
8 1/4"
9"
1"
Jt. No. 45
9"
8 1/2"
3"
Jt. No. 46
9"
7 3/4"
8 3/4"
3/4"
Jt. No. 47

FIGURE V - 126

K•E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 0780

PAVEMENT CRACKING & SPALLING Sept. 4, 1974

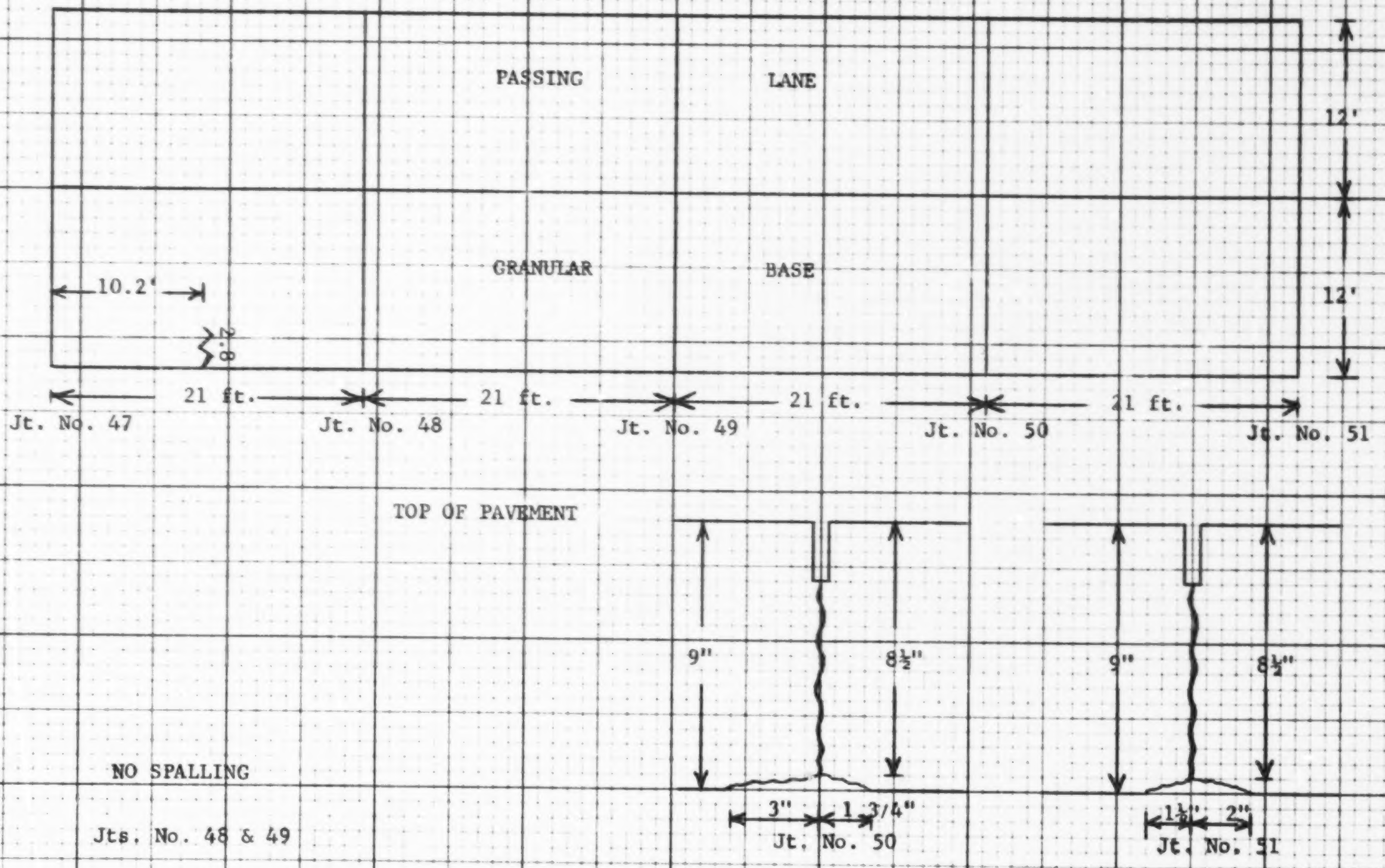

PASSING
LANE
GRANULAR
BASE
12'
12'
10.2'
2.8
21 ft.
21 ft.
21 ft.
21 ft.
Jt. No. 47
Jt. No. 48
Jt. No. 49
Jt. No. 50
Jt. No. 51
TOP OF PAVEMENT
9"
8½"
3"
1 3/4"
Jt. No. 50
9"
8½"
1½"
2"
Jt. No. 51
NO SPALLING
Jts. No. 48 & 49

FIGURE V - 127

K+E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 0780

PAVEMENT CRACKING & SPALLING Sept. 4, 1974

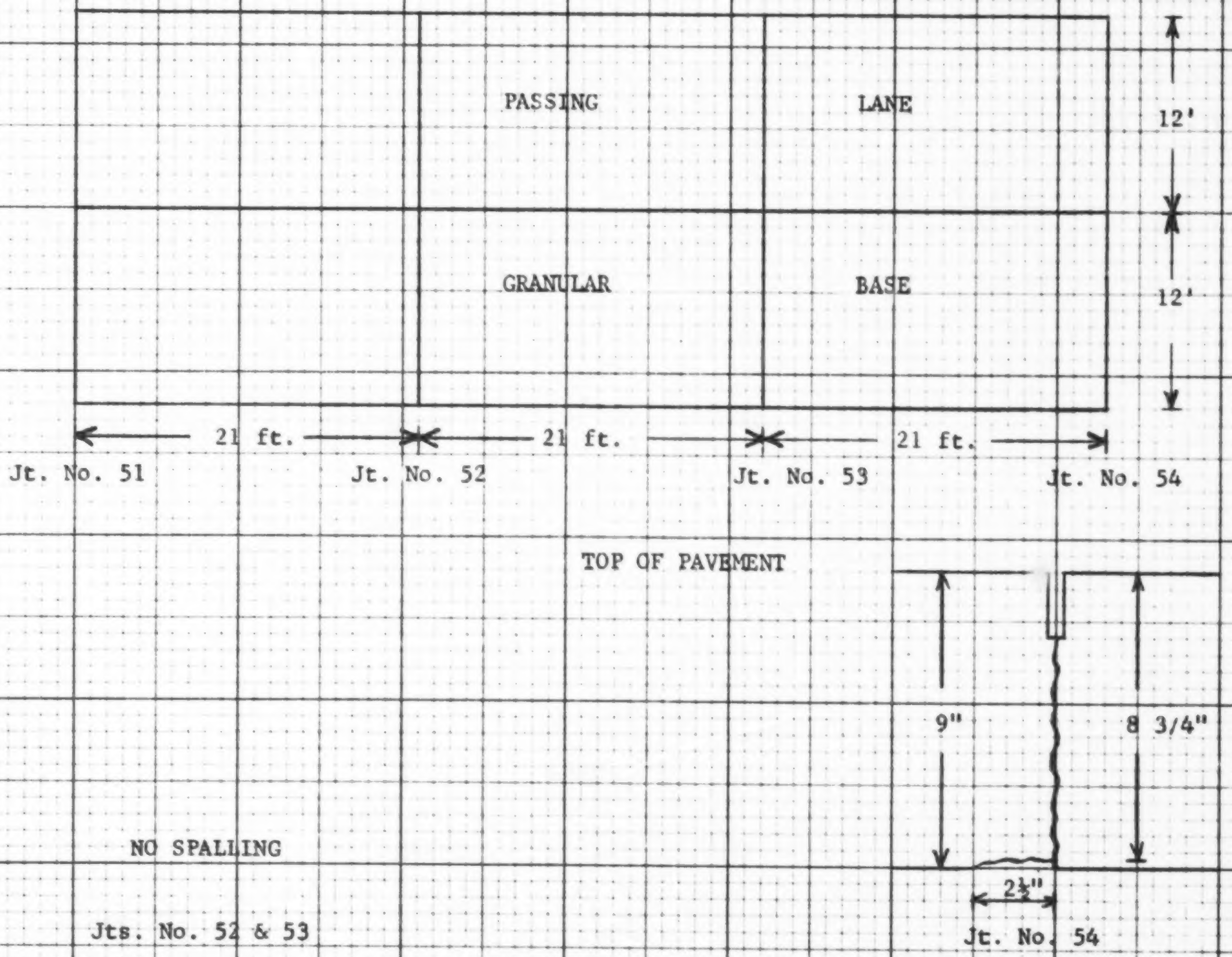

PASSING
LANE
GRANULAR
BASE
12'
12'
21 ft.
21 ft.
21 ft.
Jt. No. 51
Jt. No. 52
Jt. No. 53
Jt. No. 54
TOP OF PAVEMENT
9"
8 3/4"
2½"
Jt. No. 54
NO SPALLING
Jts. No. 52 & 53

FIGURE V - 128

K•E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 0780

PAVEMENT CRACKING & SPALLING Sept. 4, 1974

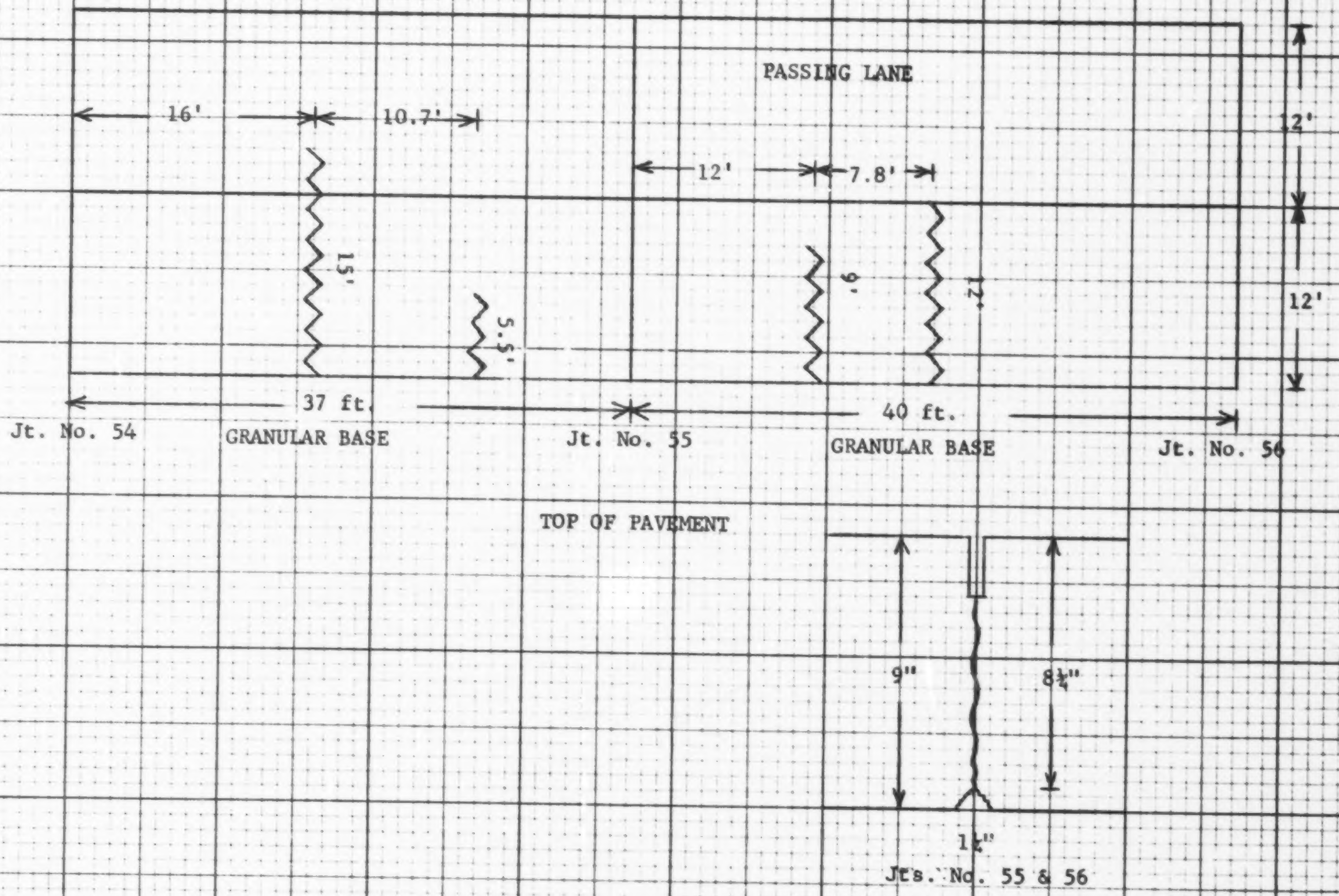

PASSING LANE
16'
10.7'
12'
7.8'
12'
12'
15'
5.5'
9'
12'
37 ft.
40 ft.
Jt. No. 54
GRANULAR BASE
Jt. No. 55
GRANULAR BASE
Jt. No. 56
TOP OF PAVEMENT
9"
8¼"
1¼"
Jts. No. 55 & 56

FIGURE V - 129

K·E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 0780

PAVEMENT CRACKING & SPALLING Sept. 4, 1974

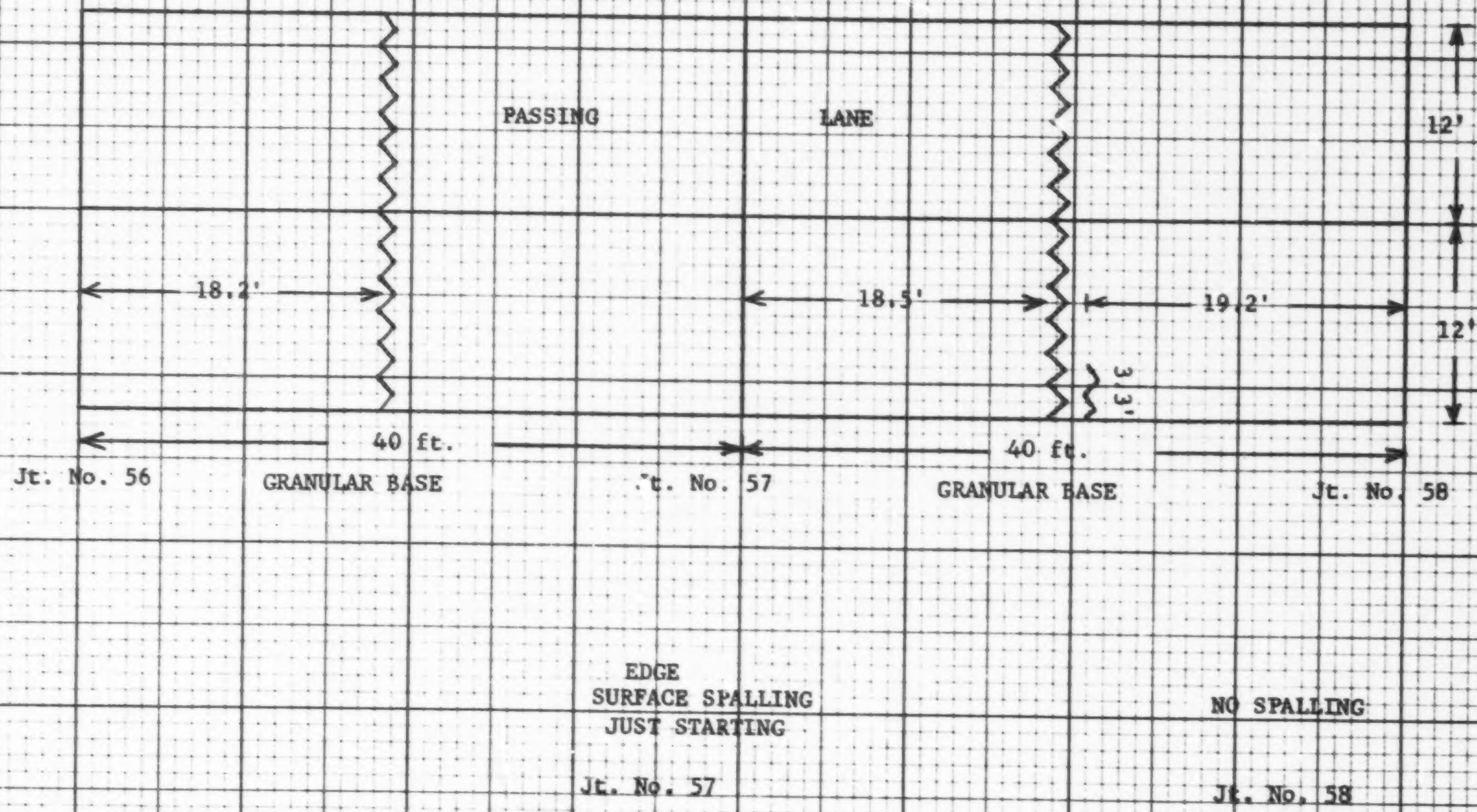

PASSING
LANE
12'
12'
18.2'
18.5'
19.2'
3.3'
40 ft.
40 ft.
Jt. No. 56
GRANULAR BASE
Jt. No. 57
GRANULAR BASE
Jt. No. 58
EDGE
SURFACE SPALLING
JUST STARTING
Jt. No. 57
NO SPALLING
Jt. No. 58

FIGURE V - 130

K+E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 0780

PAVEMENT CRACKING & SPALLING Sept. 4, 1974

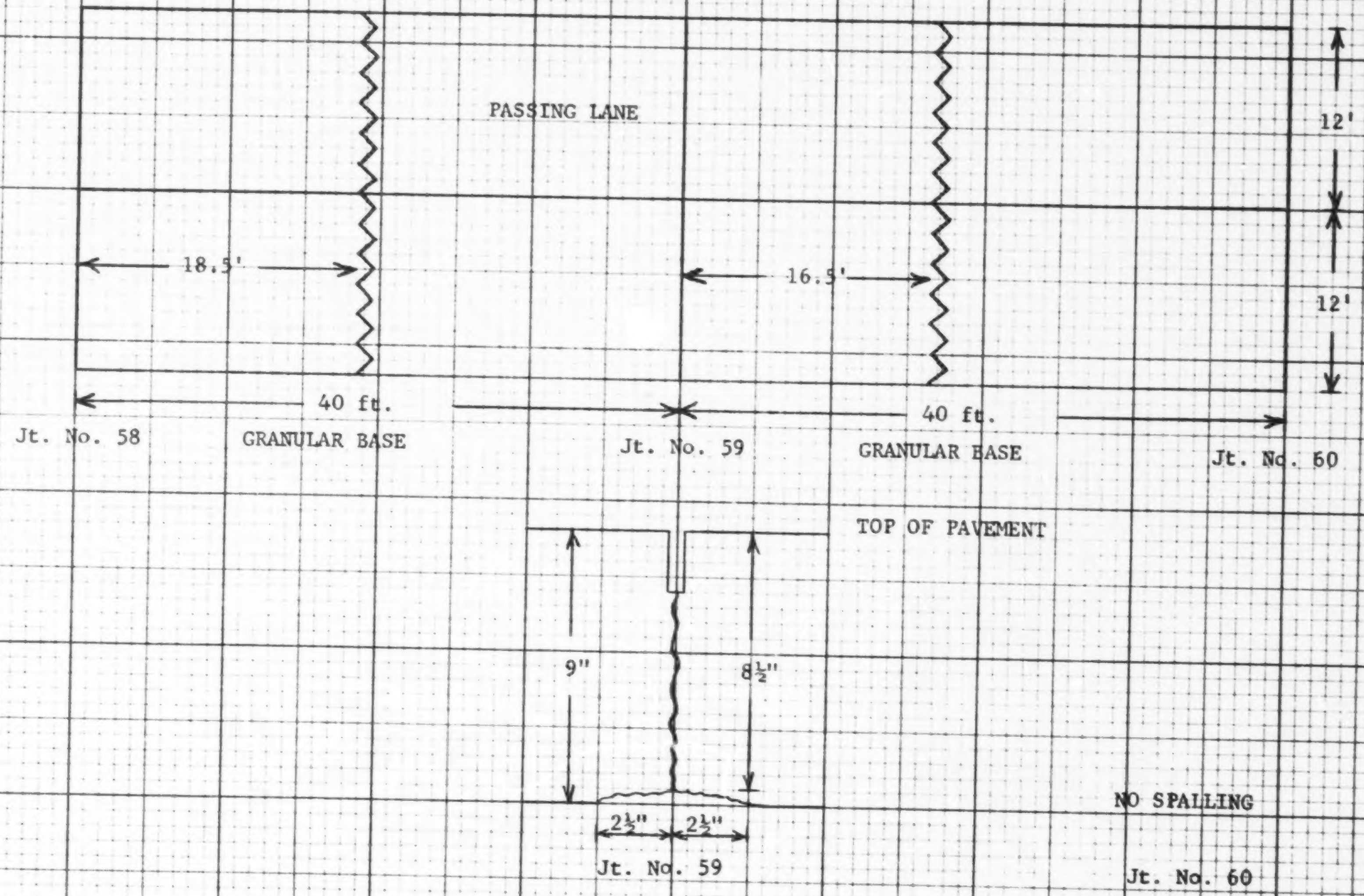

PASSING LANE
18.5'
16.5'
12'
12'
40 ft.
40 ft.
Jt. No. 58
GRANULAR BASE
Jt. No. 59
GRANULAR BASE
Jt. No. 60
TOP OF PAVEMENT
9"
8½"
2½"
2½"
NO SPALLING
Jt. No. 59
Jt. No. 60

FIGURE V - 131

K•E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 0780

PAVEMENT CRACKING & SPALLING Sept. 4, 1974

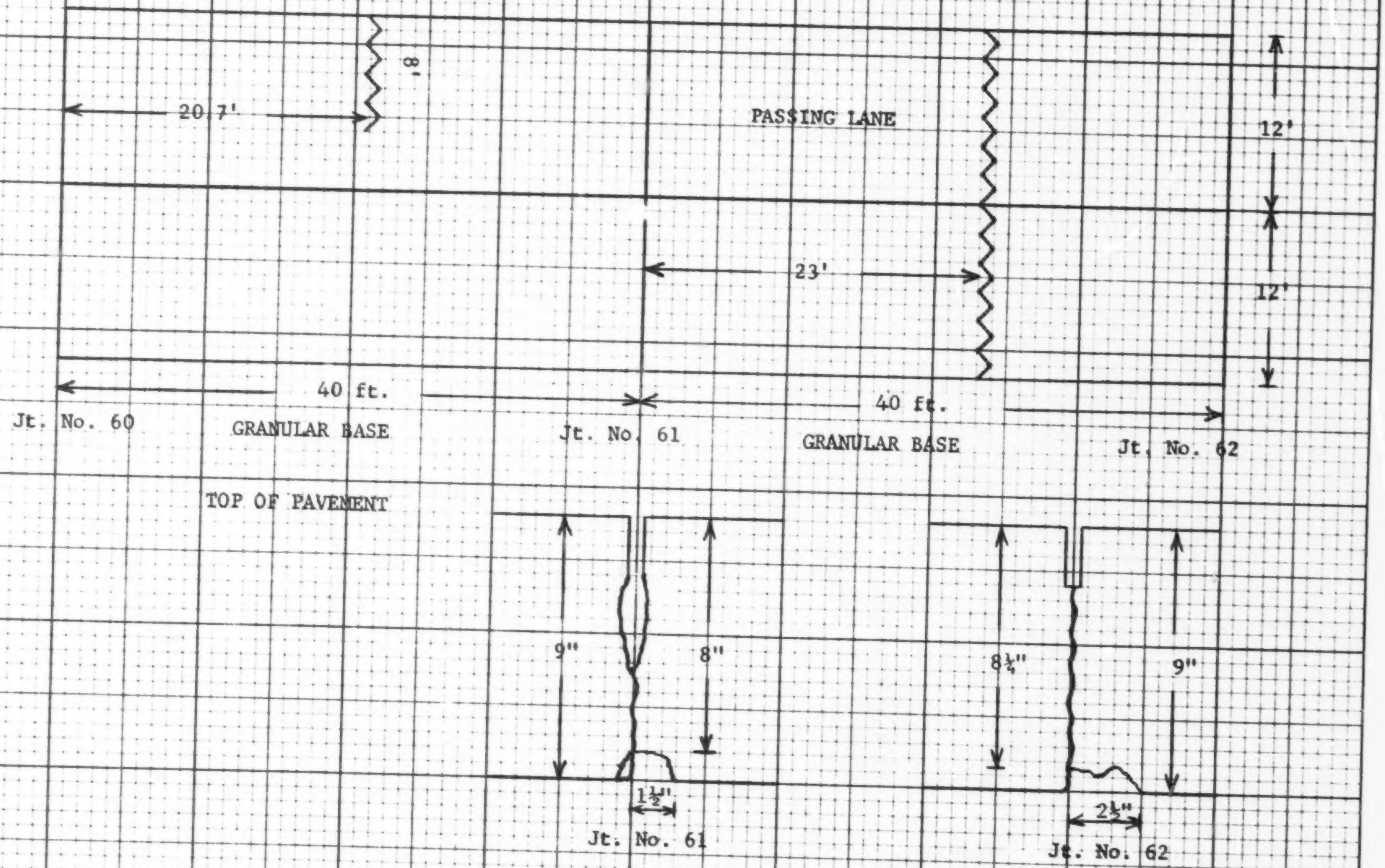

8'
20.7'
PASSING LANE
12'
23'
12'
40 ft.
40 ft.
Jt. No. 60
GRANULAR BASE
Jt. No. 61
GRANULAR BASE
Jt. No. 62
TOP OF PAVEMENT
9"
8"
1½"
Jt. No. 61
8¼"
9"
2½"
Jt. No. 62

FIGURE V - 132

K•E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 0780

PAVEMENT CRACKING & SPALLING Sept. 4, 1974

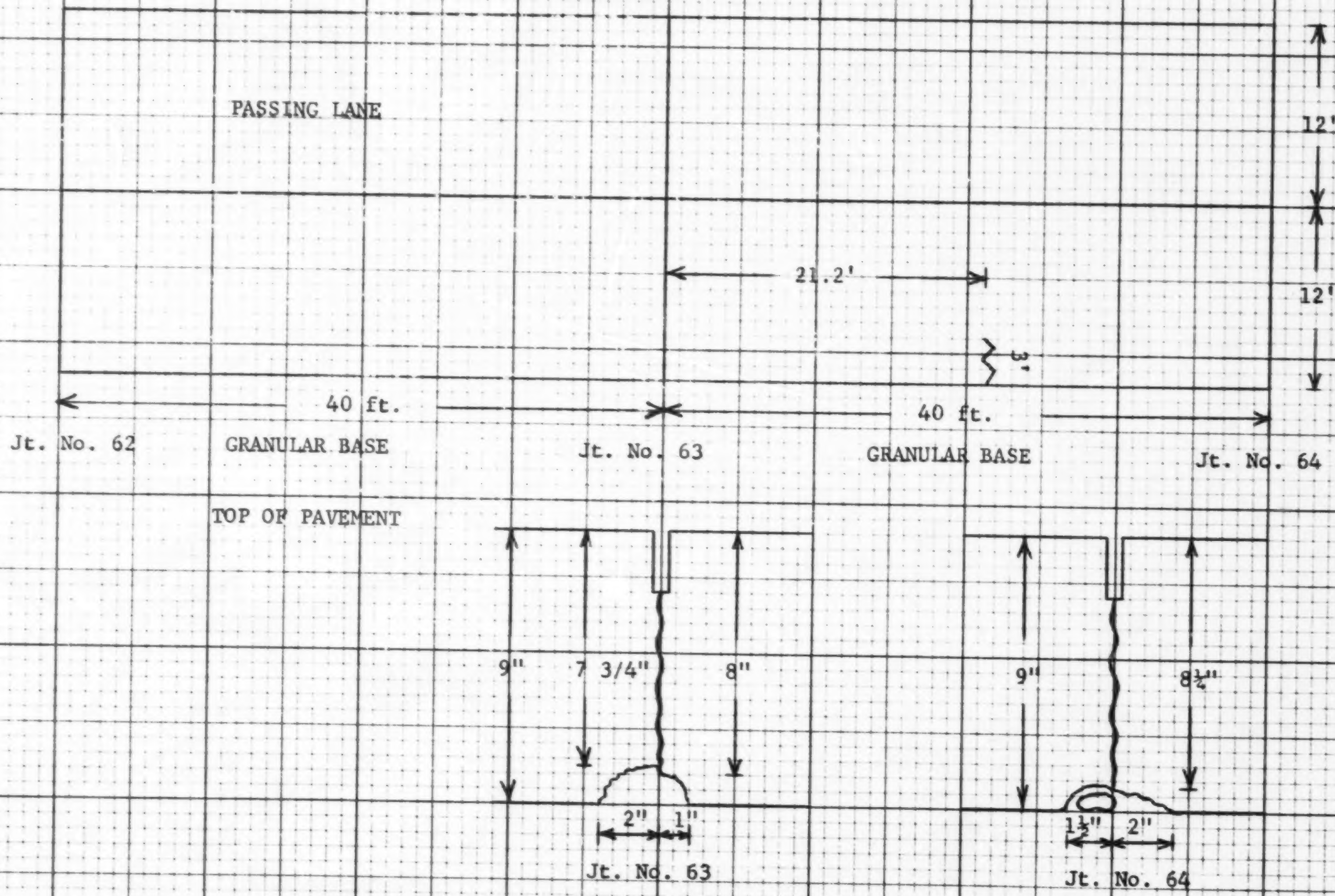
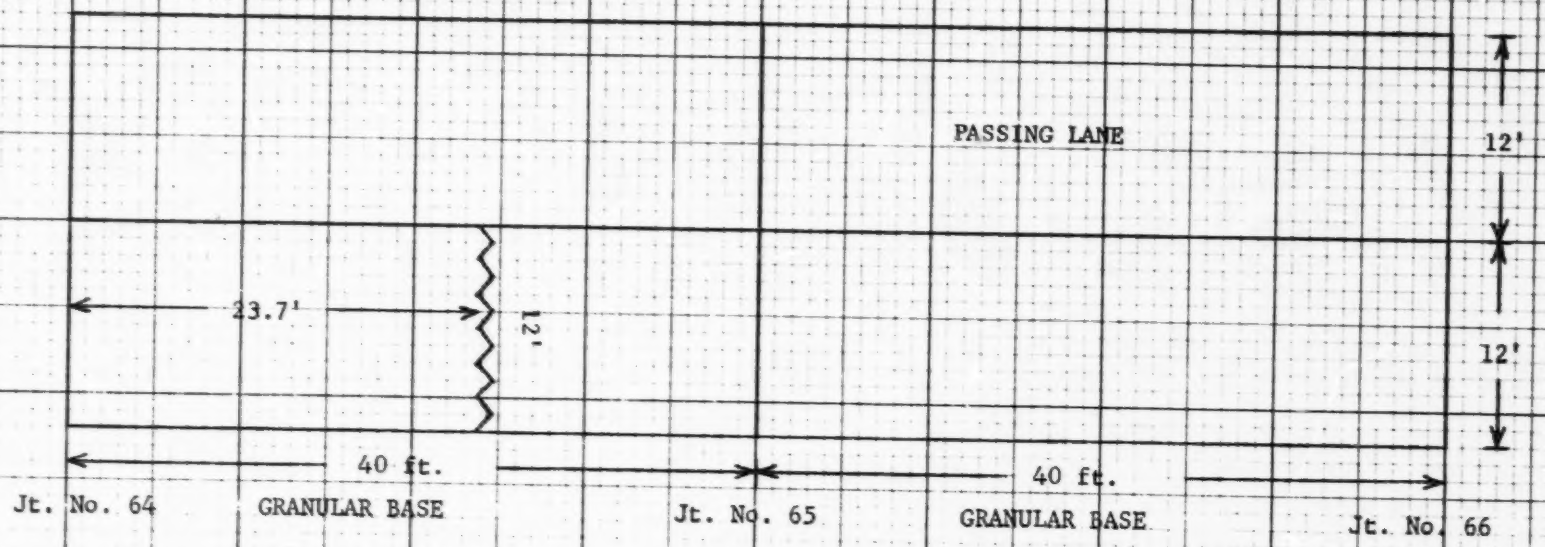

PASSING LANE
12'
12'
21.2'
3'
40 ft.
40 ft.
Jt. No. 62
GRANULAR BASE
Jt. No. 63
GRANULAR BASE
Jt. No. 64
TOP OF PAVEMENT
9"
7 3/4"
8"
2"
1"
Jt. No. 63
9"
8¼"
1½"
2"
Jt. No. 64

FIGURE V - 133

K+E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 0780

PAVEMENT CRACKING & SPALLING Sept. 4, 1974


PASSING LANE
12'
12'
23.7'
12'
40 ft.
40 ft.
Jt. No. 64
GRANULAR BASE
Jt. No. 65
GRANULAR BASE
Jt. No. 66

NO SPALLING

Jts. No. 65 & 66

FIGURE V - 134

K+E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 0780

PAVEMENT CRACKING & SPALLING Sept. 4, 1974

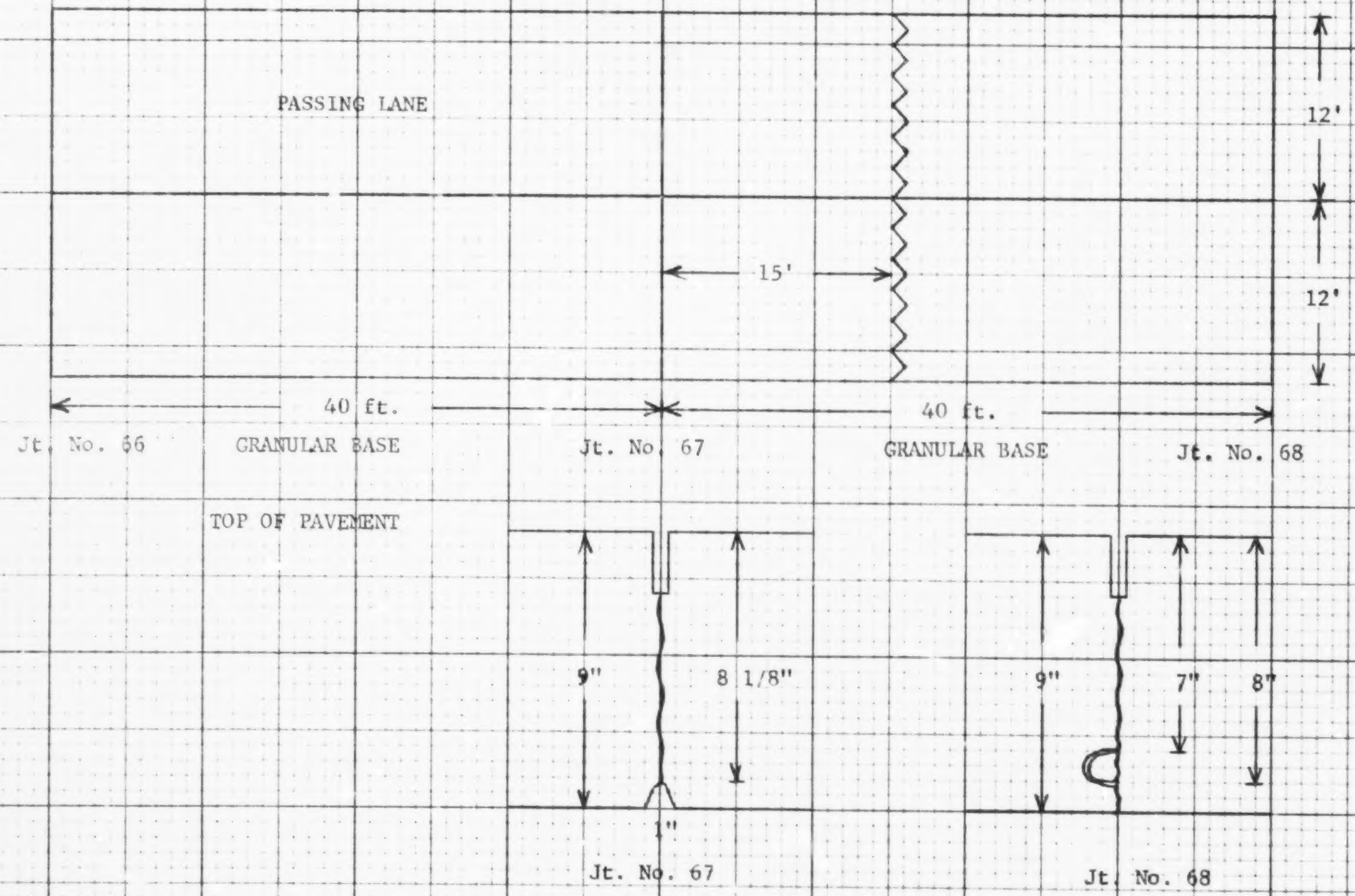

PASSING LANE
12'
12'
15'
40 ft.
40 ft.
Jt. No. 66
GRANULAR BASE
Jt. No. 67
GRANULAR BASE
Jt. No. 68
TOP OF PAVEMENT
9"
8 1/8"
1"
Jt. No. 67
9"
7"
8"
Jt. No. 68

FIGURE V - 135

K+E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 0780

PAVEMENT CRACKING & SPALLING Sept. 4, 1974

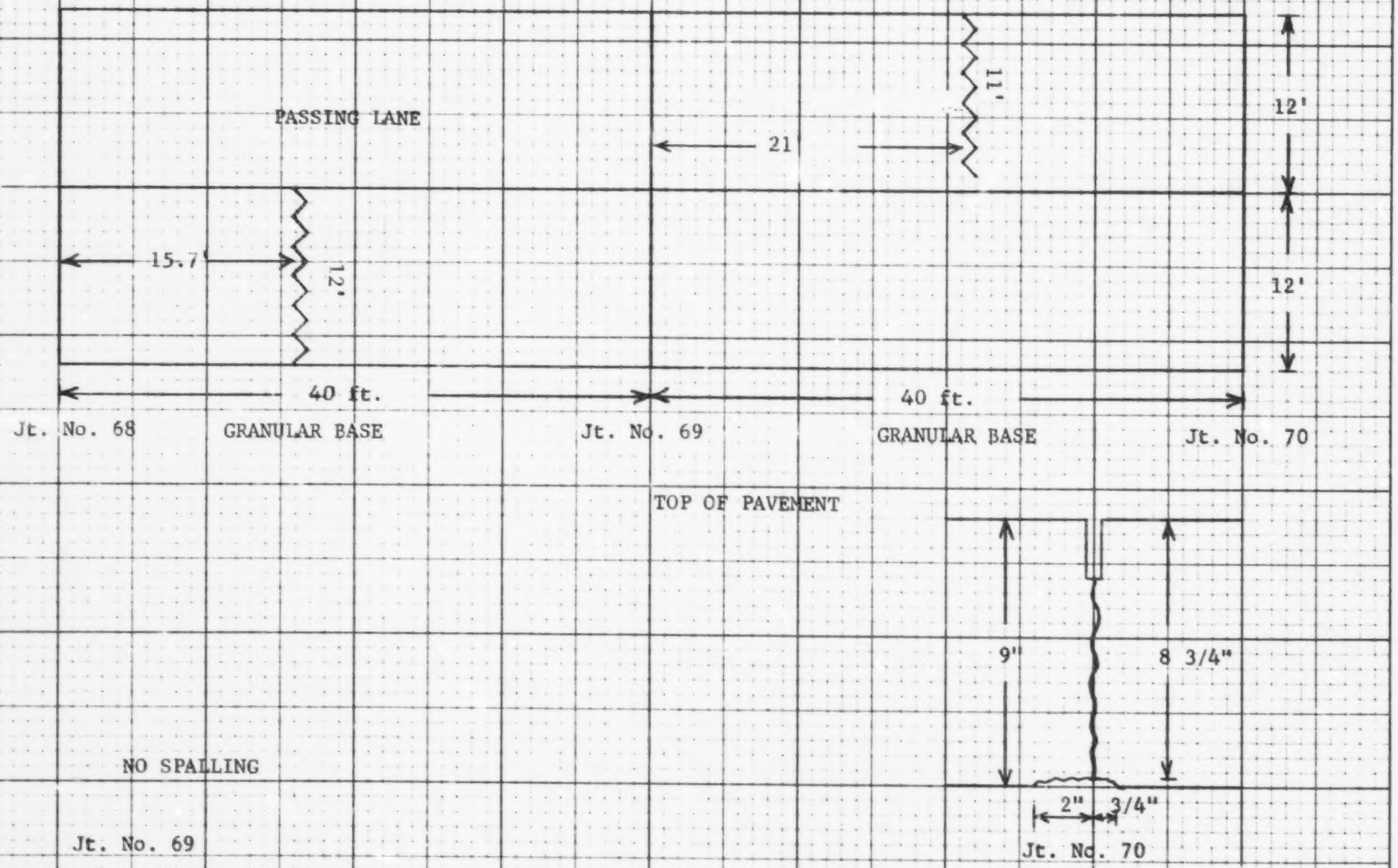

PASSING LANE
11'
21
12'
12'
15.7'
12'
40 ft.
40 ft.
Jt. No. 68
GRANULAR BASE
Jt. No. 69
GRANULAR BASE
Jt. No. 70
TOP OF PAVEMENT
9"
8 3/4"
2"
3/4"
Jt. No. 70
NO SPALLING
Jt. No. 69

FIGURE V - 136

K&E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 0780

PAVEMENT CRACKING & SPALLING Sept. 4, 1974

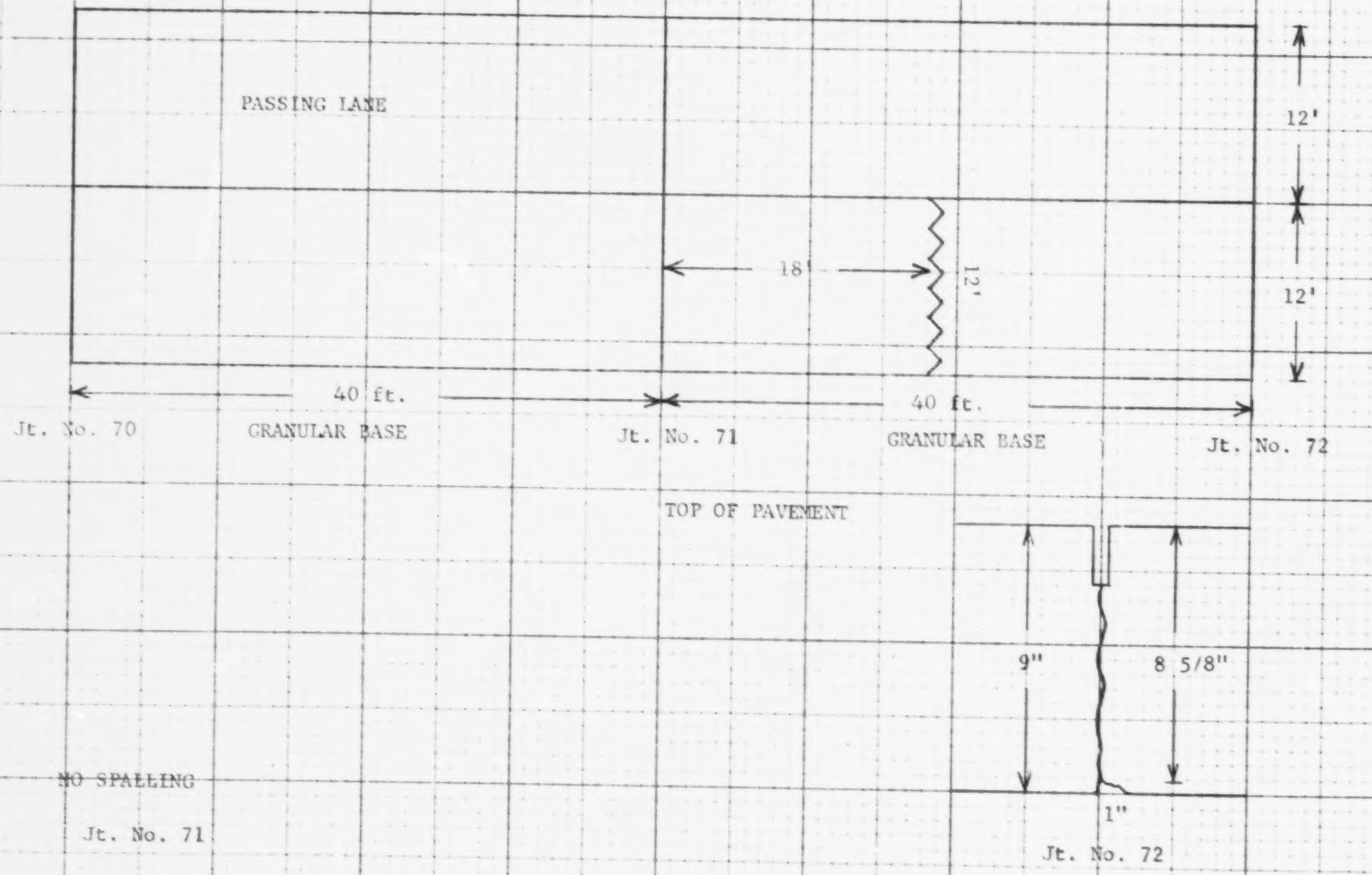

PASSING LANE
12'
12'
18'
12'
40 ft.
40 ft.
Jt. No. 70
GRANULAR BASE
Jt. No. 71
GRANULAR BASE
Jt. No. 72
TOP OF PAVEMENT
9"
8 5/8"
1"
Jt. No. 72
NO SPALLING
Jt. No. 71

FIGURE V - 137

K+E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 0780

PAVEMENT CRACKING & SPALLING Sept. 4, 1974

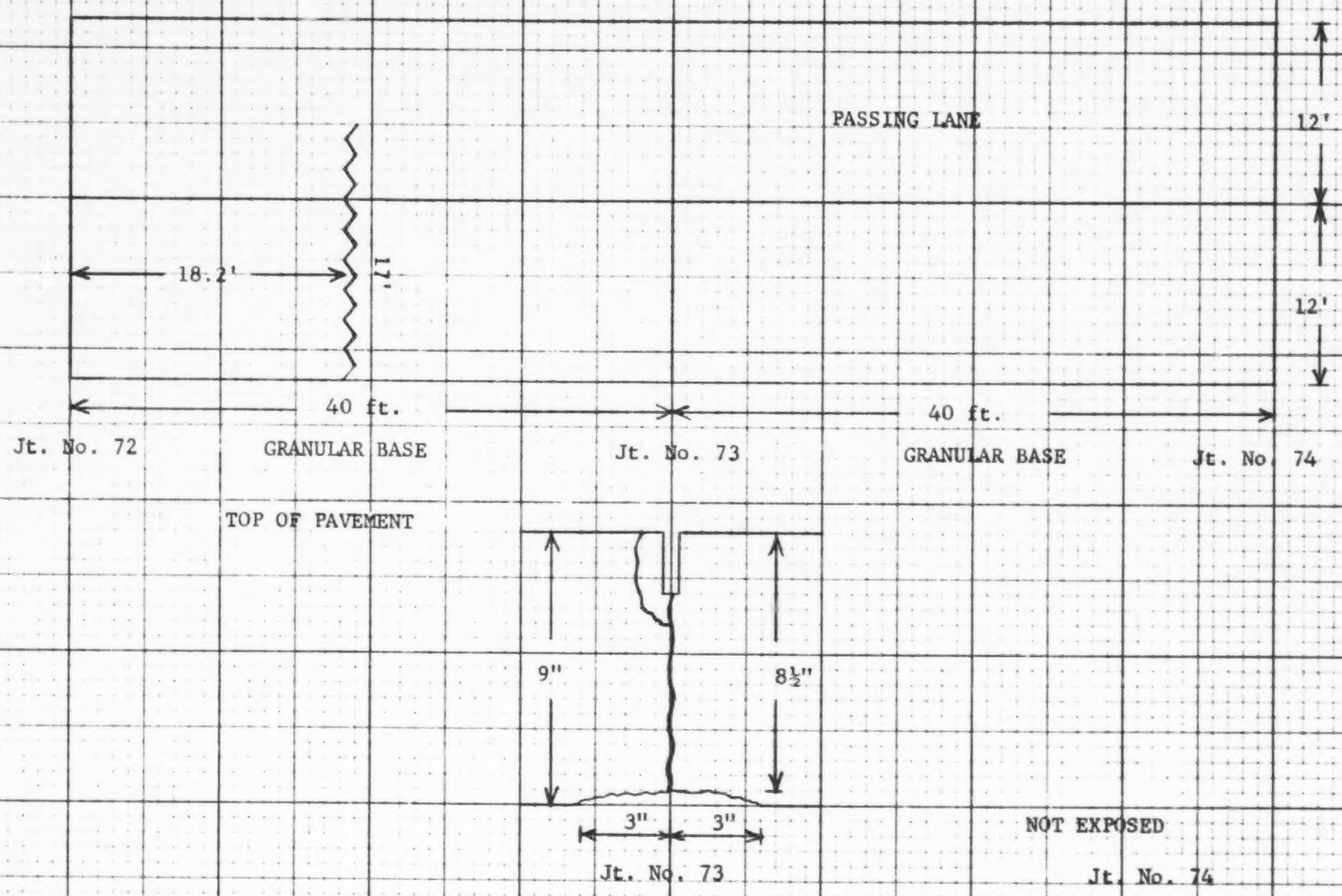

PASSING LANE
12'
12'
18.2'
17'
40 ft.
40 ft.
Jt. No. 72
GRANULAR BASE
Jt. No. 73
GRANULAR BASE
Jt. No. 74
TOP OF PAVEMENT
9"
8½"
3"
3"
Jt. No. 73
NOT EXPOSED
Jt. No. 74

FIGURE V - 138

K+E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 0780

PAVEMENT CRACKING & SPALLING Sept. 4, 1974

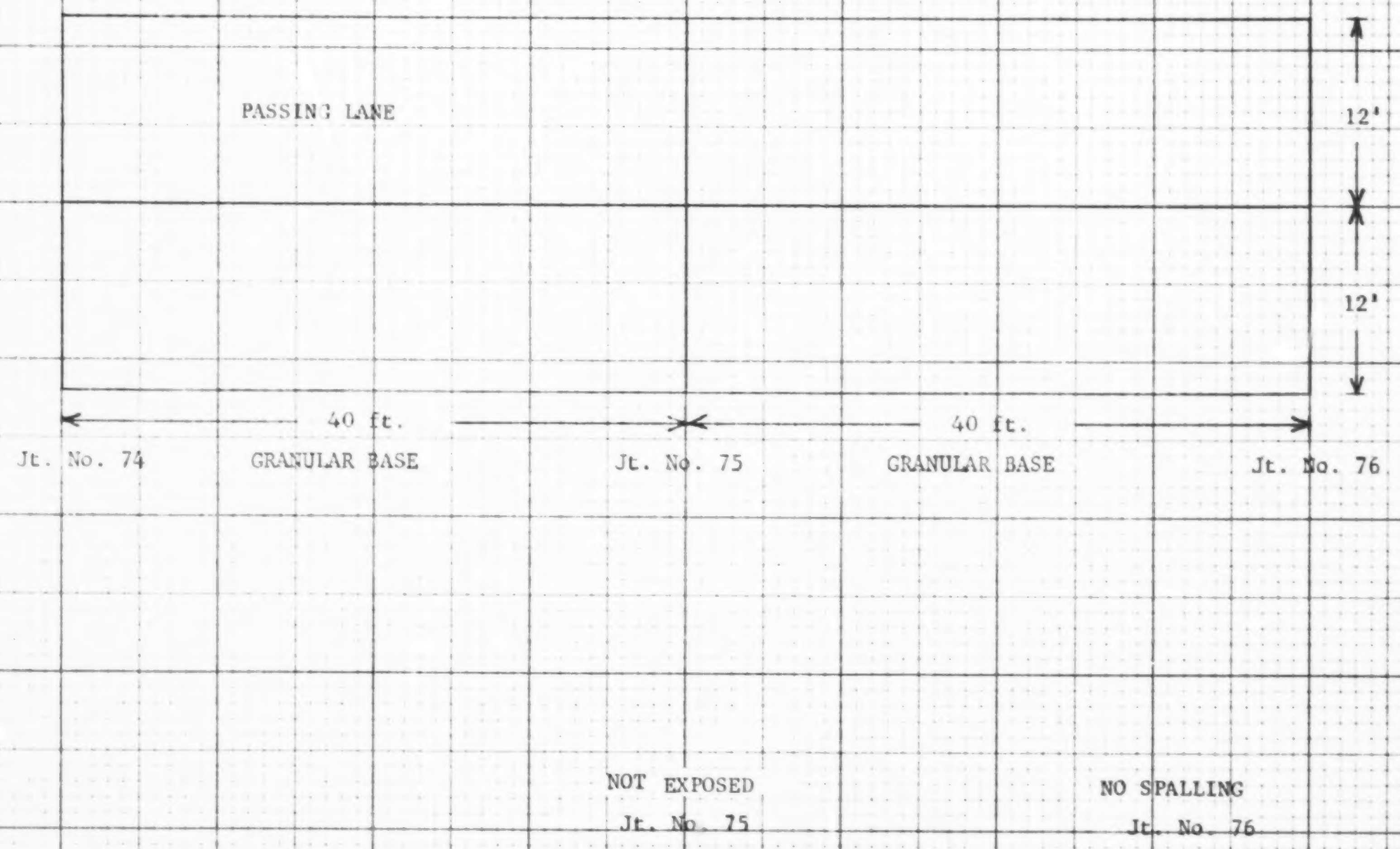

PASSING LANE
12'
12'
40 ft.
40 ft.
Jt. No. 74
GRANULAR BASE
Jt. No. 75
GRANULAR BASE
Jt. No. 76
NOT EXPOSED
Jt. No. 75
NO SPALLING
Jt. No. 76

FIGURE V - 139

K+E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 0780

PAVEMENT CRACKING & SPALLING Sept. 4, 1974

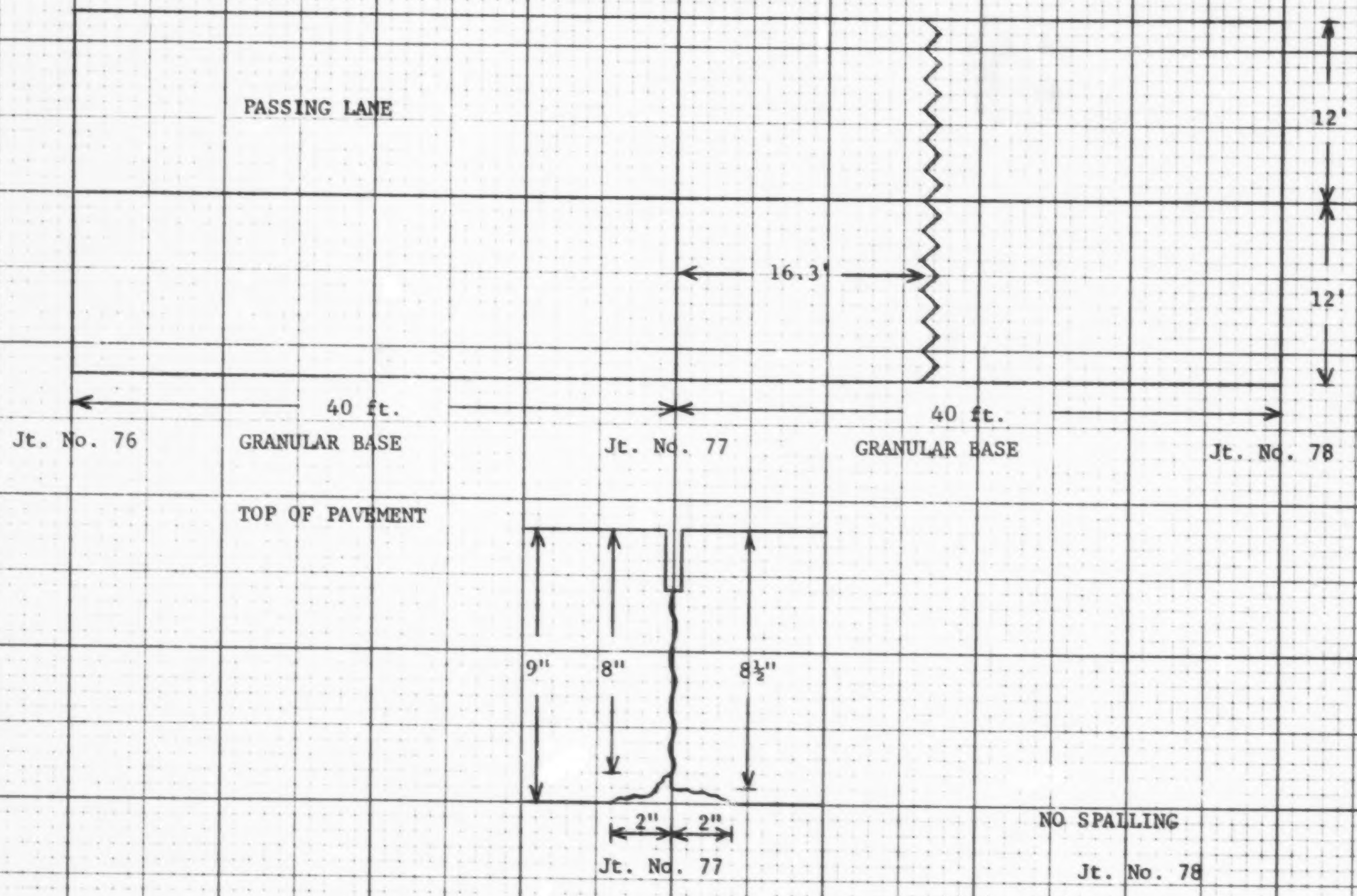

PASSING LANE
12'
12'
16.3'
40 ft.
40 ft.
Jt. No. 76
GRANULAR BASE
Jt. No. 77
GRANULAR BASE
Jt. No. 78
TOP OF PAVEMENT
9"
8"
8½"
2"
2"
Jt. No. 77
NO SPALLING
Jt. No. 78

FIGURE V - 140

K+E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 0780

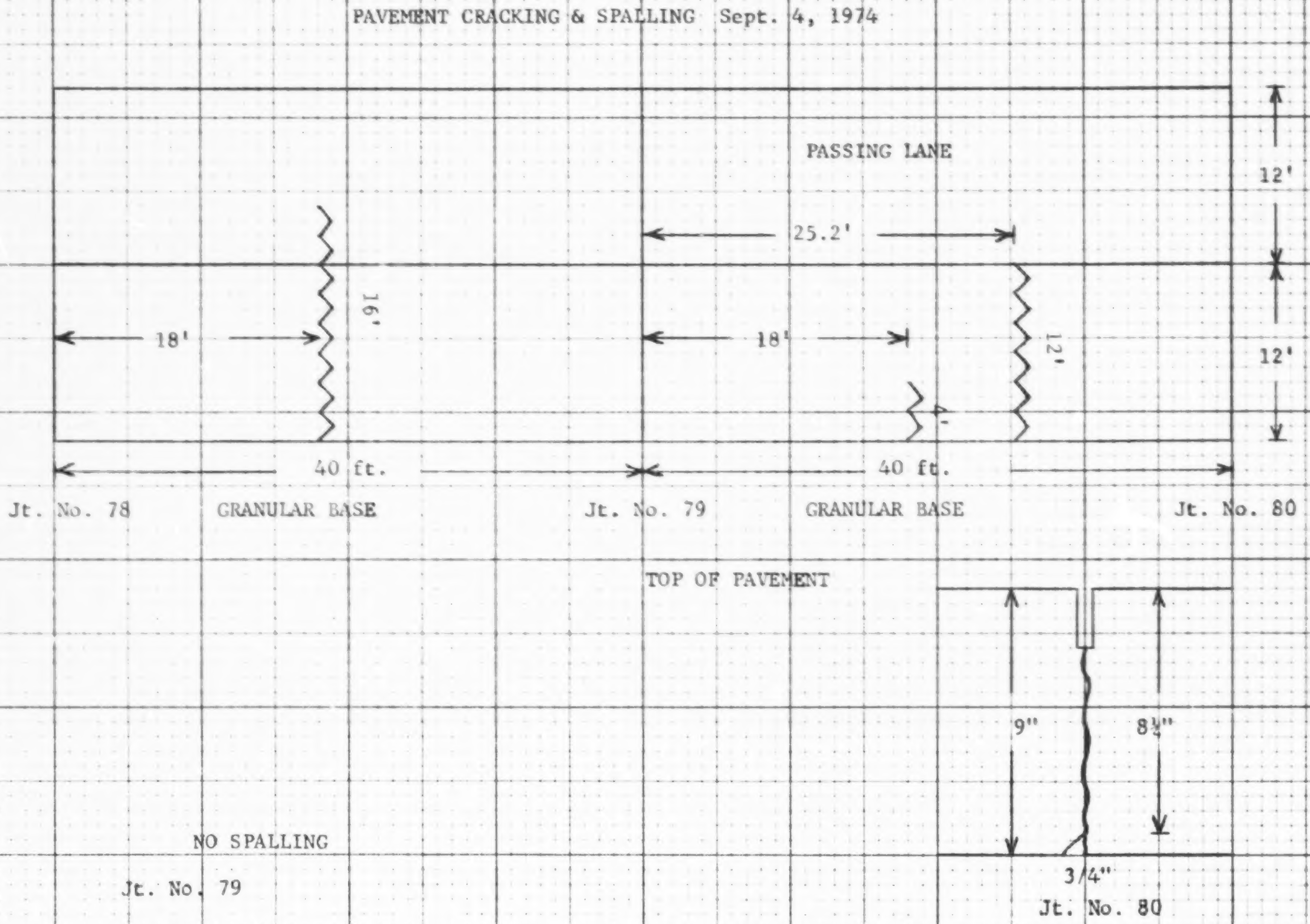

PAVEMENT CRACKING & SPALLING Sept. 4, 1974
PASSING LANE
12'
12'
25.2'
18'
16'
18'
12'
4'
40 ft.
40 ft.
Jt. No. 78
GRANULAR BASE
Jt. No. 79
GRANULAR BASE
Jt. No. 80
TOP OF PAVEMENT
9"
8½"
3/4"
Jt. No. 80
NO SPALLING
Jt. No. 79

FIGURE V - 141

46 0780

PAVEMENT CRACKING & SPALLING Sept. 4, 1974

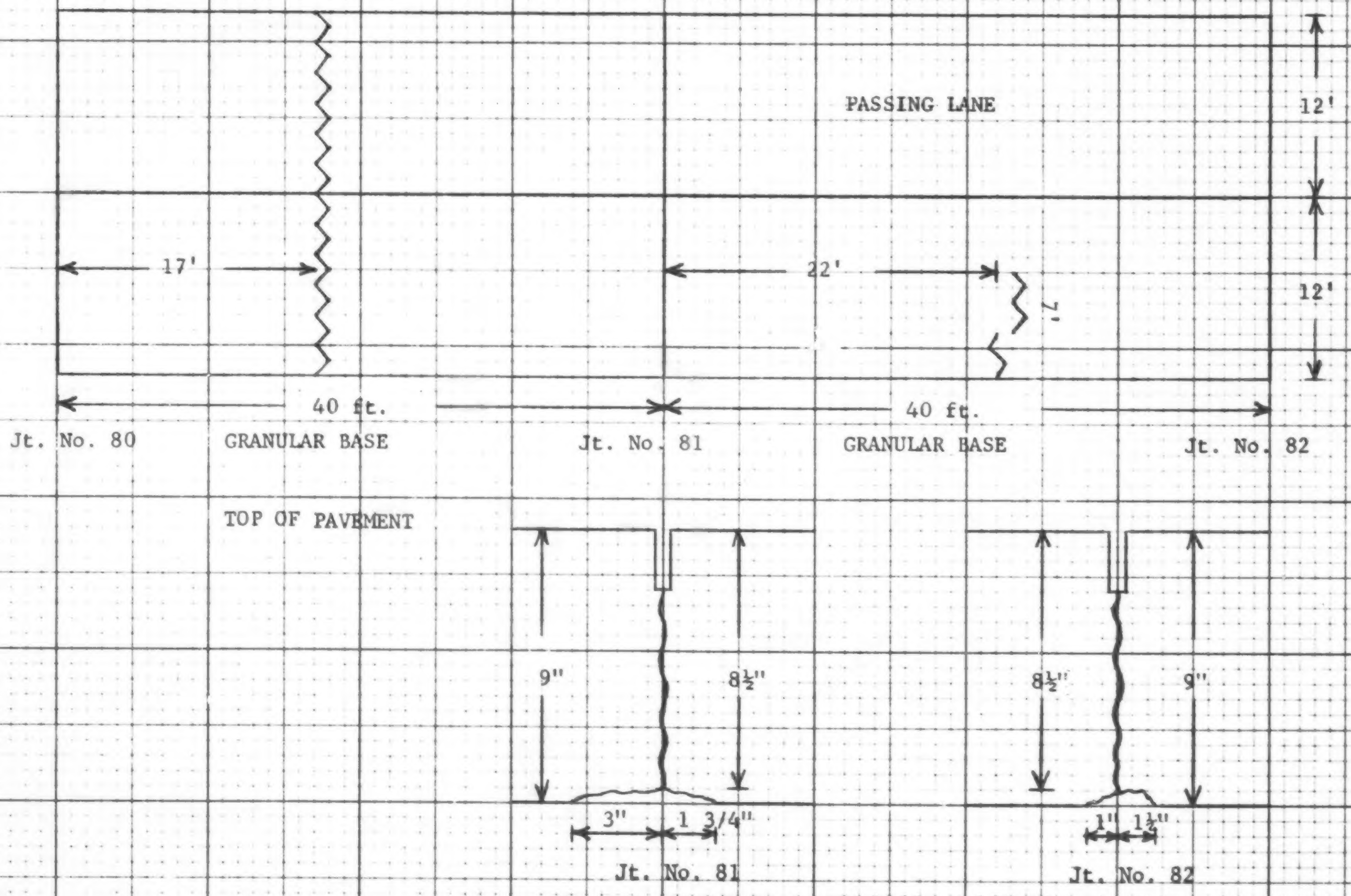

PASSING LANE
12'
12'
17'
22'
7'
40 ft.
40 ft.
Jt. No. 80
GRANULAR BASE
Jt. No. 81
GRANULAR BASE
Jt. No. 82
TOP OF PAVEMENT
9"
8½"
3"
1 3/4"
Jt. No. 81
8½"
9"
1"
1½"
Jt. No. 82

FIGURE V - 142

K+E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 0780

PAVEMENT CRACKING & SPALLING Sept. 4, 1974

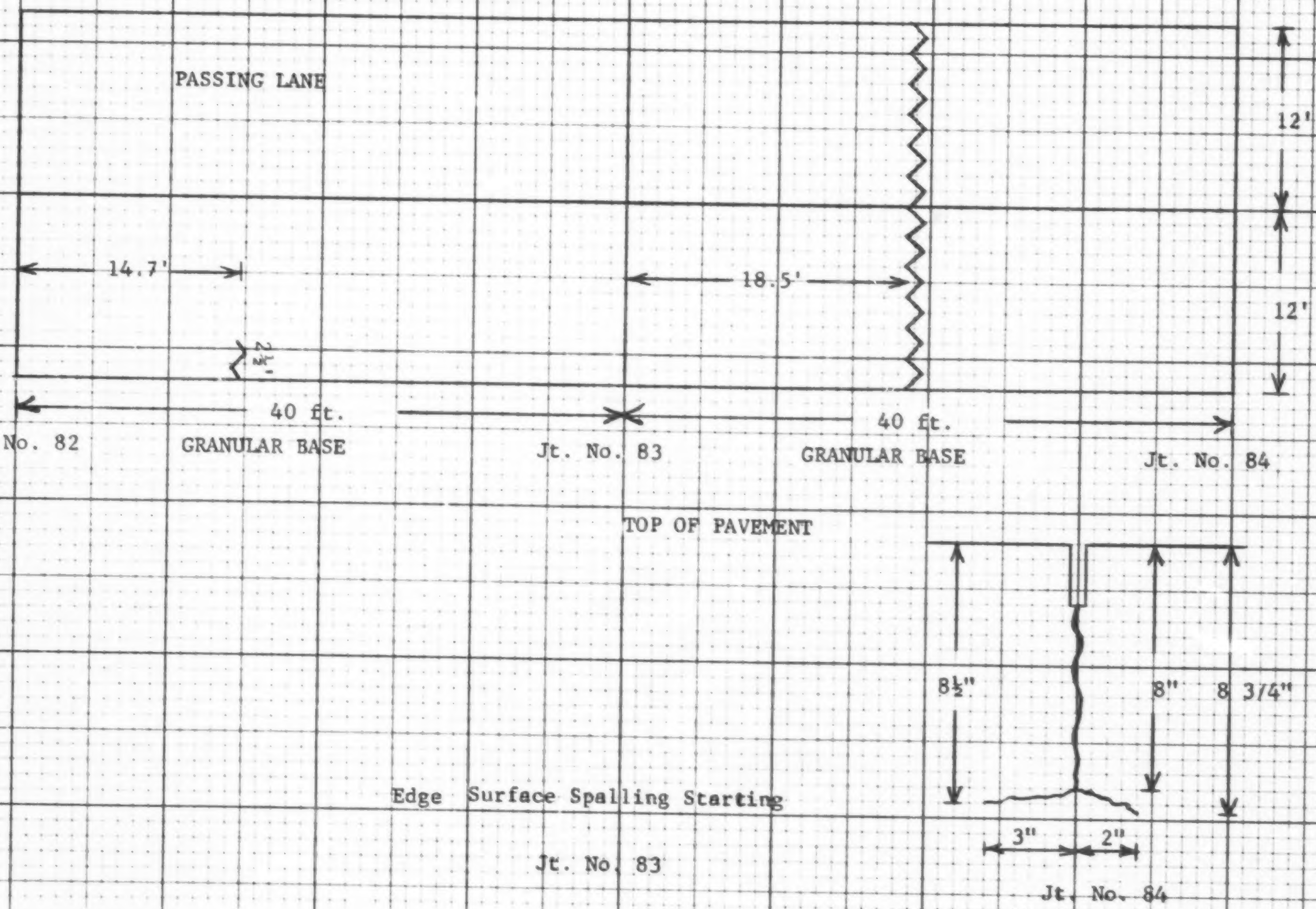

PASSING LANE
12'
12'
14.7'
18.5'
2¼'
40 ft.
40 ft.
Jt. No. 82
GRANULAR BASE
Jt. No. 83
GRANULAR BASE
Jt. No. 84
TOP OF PAVEMENT
8½"
8"
8 3/4"
3"
2"
Edge Surface Spalling Starting
Jt. No. 83
Jt. No. 84

FIGURE V - 143

46 0780

PAVEMENT CRACKING & SPALLING Sept. 4, 1974

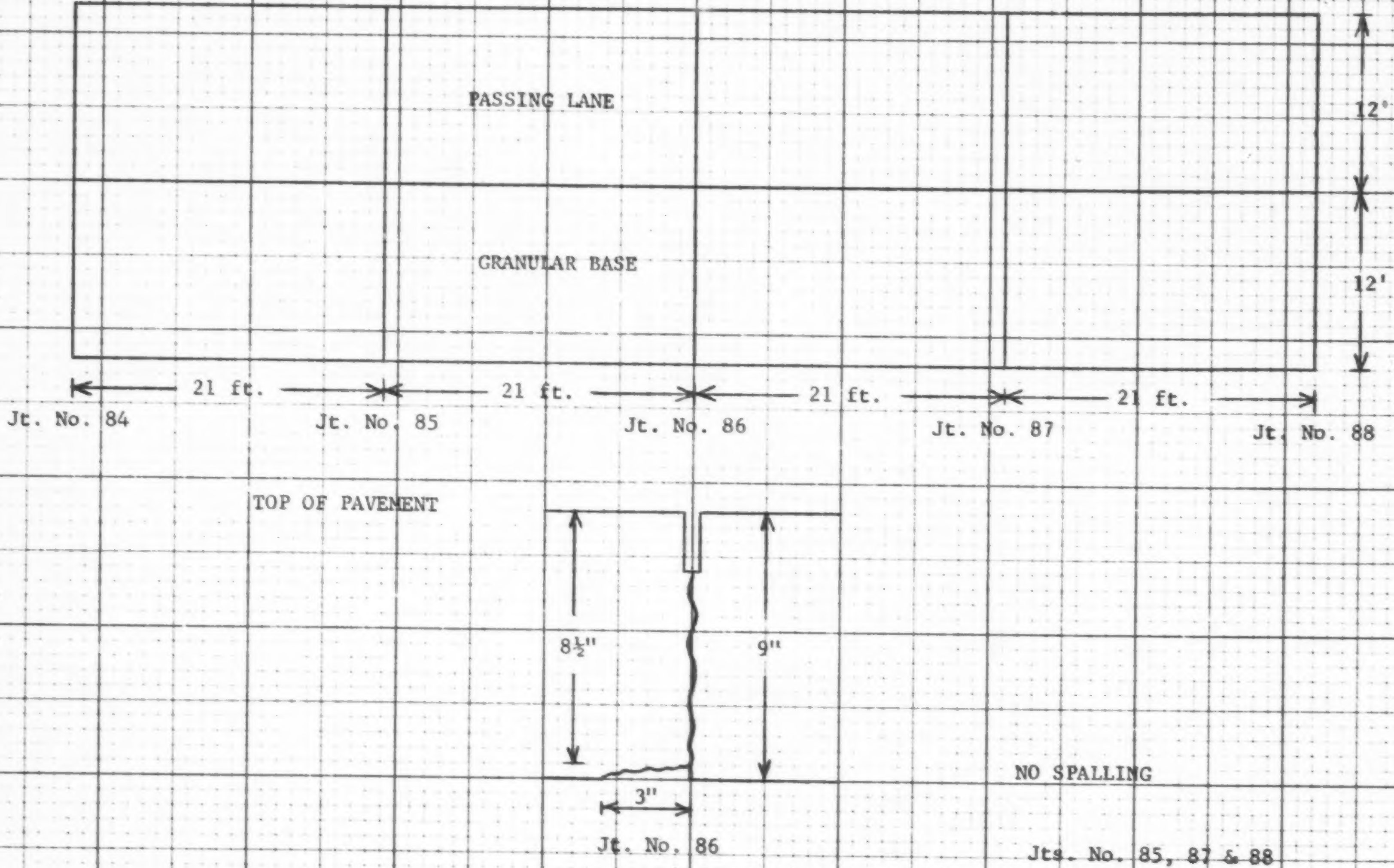
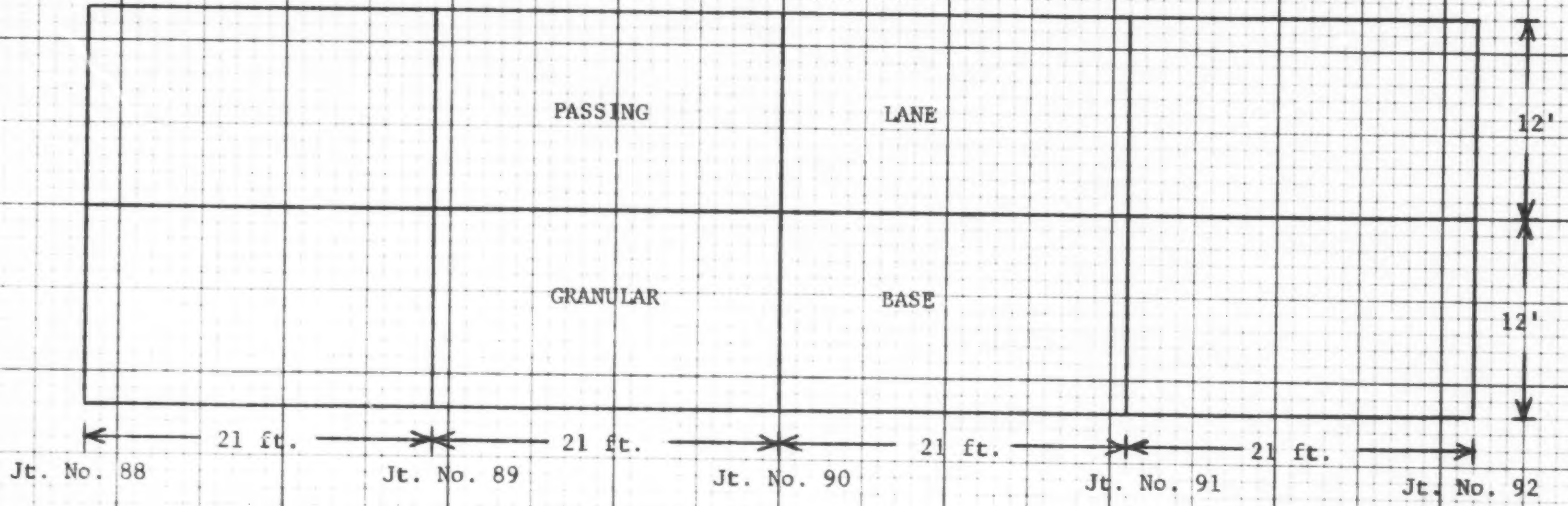

PASSING LANE
GRANULAR BASE
12'
12'
21 ft.
21 ft.
21 ft.
21 ft.
Jt. No. 84
Jt. No. 85
Jt. No. 86
Jt. No. 87
Jt. No. 88
TOP OF PAVEMENT
8½"
9"
3"
Jt. No. 86
NO SPALLING
Jts. No. 85, 87 & 88

FIGURE V-144

K•E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 0780

PAVEMENT CRACKING & SPALLING Sept. 4, 1974


PASSING
LANE
GRANULAR
BASE
12'
12'
21 ft.
21 ft.
21 ft.
21 ft.
Jt. No. 88
Jt. No. 89
Jt. No. 90
Jt. No. 91
Jt. No. 92

NO SPALLING

Jts. No. 89, 90, 91 & 92

FIGURE V - 145

K&E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 0780

PAVEMENT CRACKING & SPALLING Sept. 4, 1974

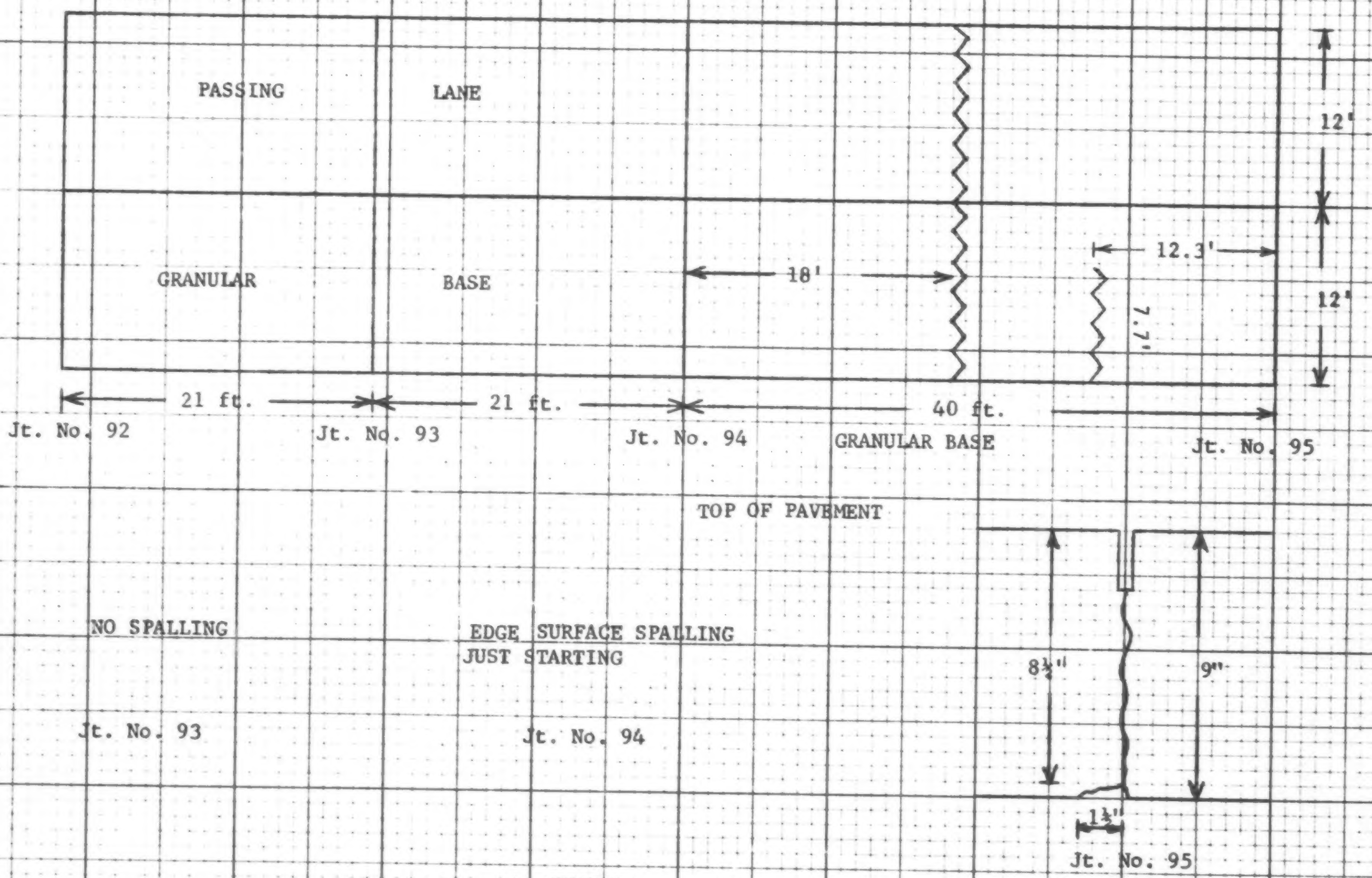

PASSING
LANE
GRANULAR
BASE
18'
12.3'
7.7'
12'
12'
21 ft.
21 ft.
40 ft.
Jt. No. 92
Jt. No. 93
Jt. No. 94
GRANULAR BASE
Jt. No. 95
TOP OF PAVEMENT
NO SPALLING
EDGE SURFACE SPALLING
JUST STARTING
Jt. No. 93
Jt. No. 94
8½"
9"
1½"
Jt. No. 95

FIGURE V - 146

46 0780

PAVEMENT CRACKING & SPALLING Sept. 4, 1974

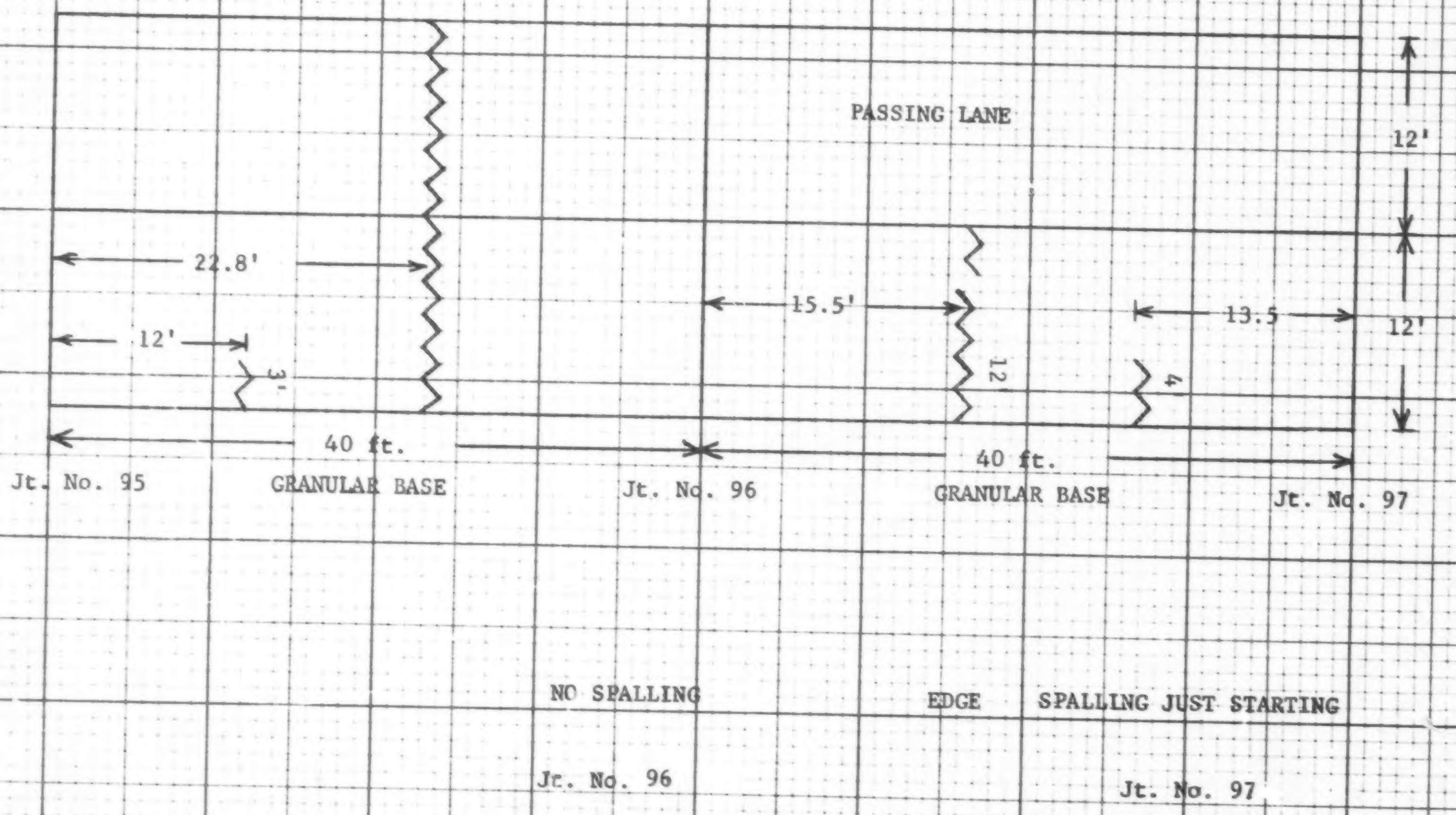

PASSING LANE
12'
12'
22.8'
12'
3'
15.5'
12'
13.5
4
40 ft.
40 ft.
Jt. No. 95
GRANULAR BASE
Jt. No. 96
GRANULAR BASE
Jt. No. 97
NO SPALLING
EDGE SPALLING JUST STARTING
Jt. No. 96
Jt. No. 97

FIGURE V - 147

K&E 10 X 10 TO THE INCH 7 X 10 INCHES KEUFFEL & ESSER CO. MADE IN U.S.A. 46 0780

PAVEMENT CRACKING & SPALLING Sept. 4, 1974

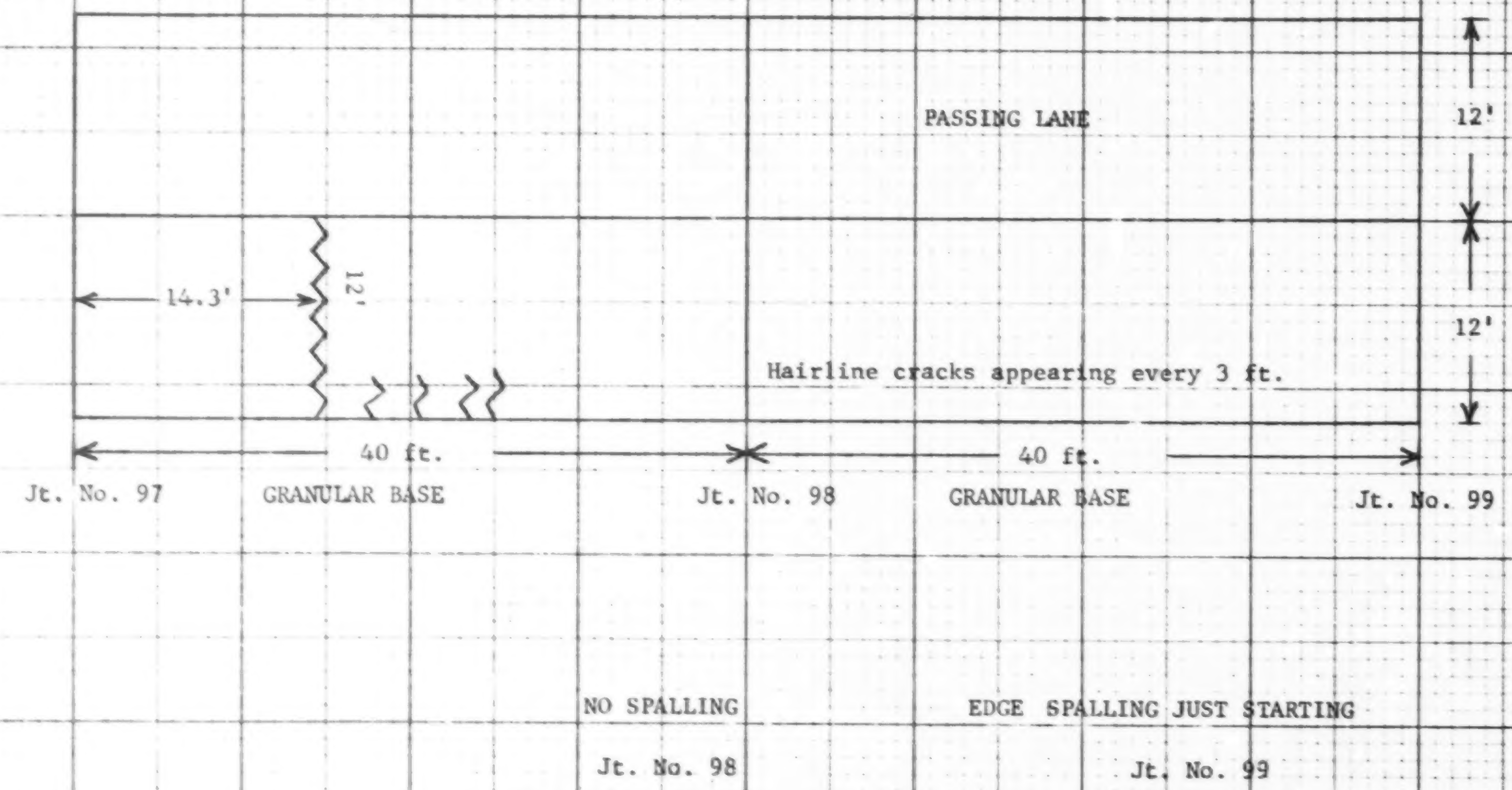
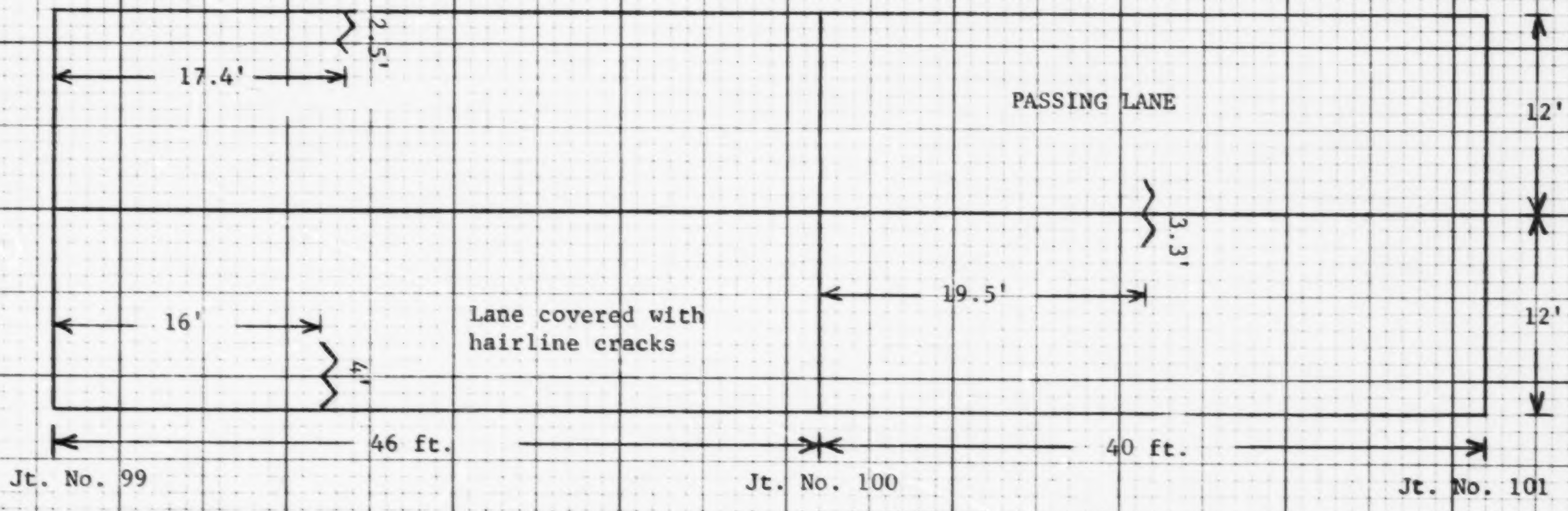

PASSING LANE
12'
12'
14.3'
12'
Hairline cracks appearing every 3 ft.
40 ft.
40 ft.
Jt. No. 97
GRANULAR BASE
Jt. No. 98
GRANULAR BASE
Jt. No. 99
NO SPALLING
Jt. No. 98
EDGE SPALLING JUST STARTING
Jt. No. 99

FIGURE V - 148

K·E 10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 0780

PAVEMENT CRACKING & SPALLING Sept. 4, 1974


2.5'
17.4'
PASSING LANE
12'
3.3'
19.5'
12'
16'
Lane covered with hairline cracks
4'
46 ft.
40 ft.
Jt. No. 99
Jt. No. 100
Jt. No. 101

NO SPALLING
Jt. No. 100

EXPANSION JOINT
Jt. No. 101

FIGURE V - 149

K+E 10 X 10 TO ½ INCH 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 1320

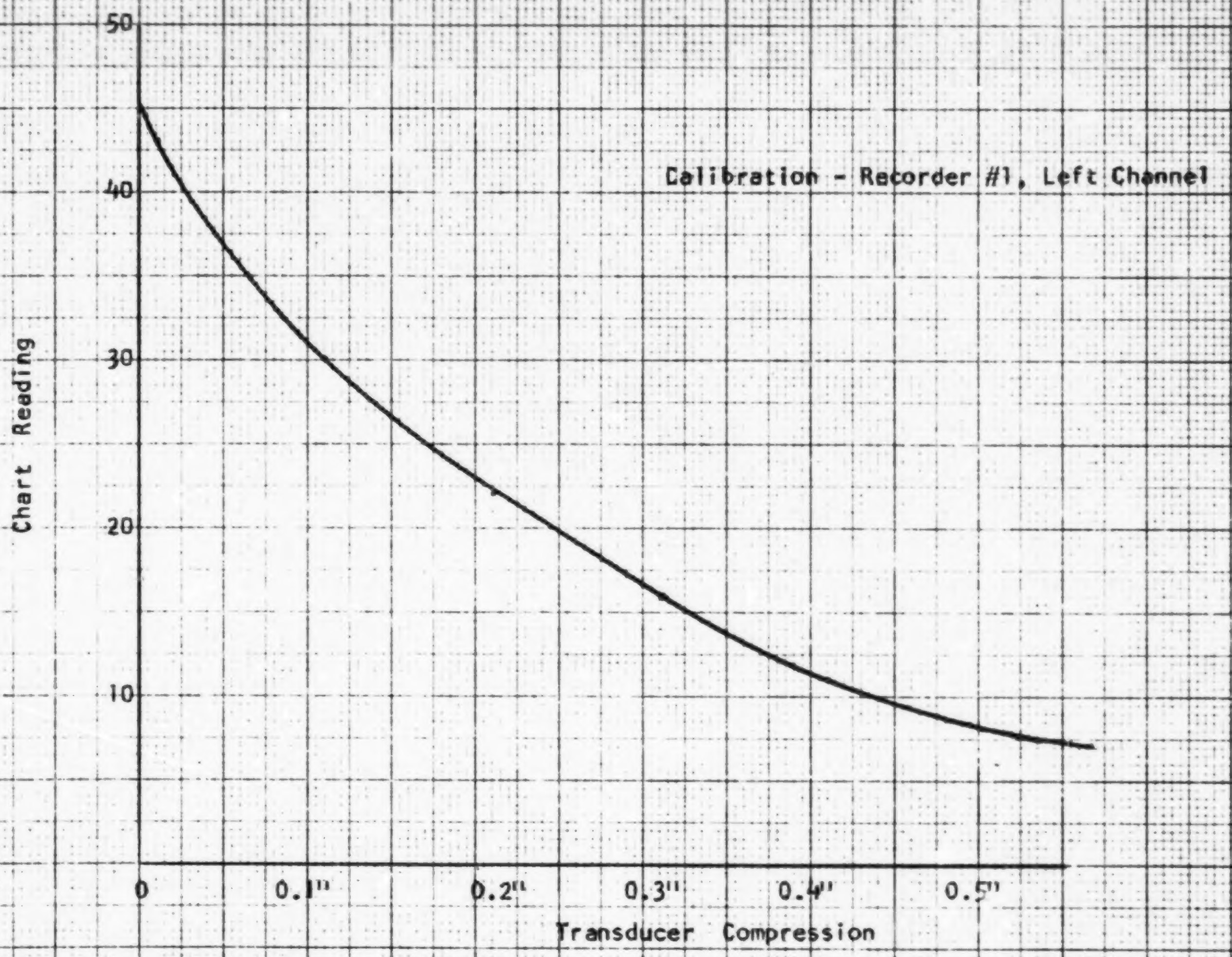


Figure V - 150

K•E 10 X 10 TO ½ INCH 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 1320

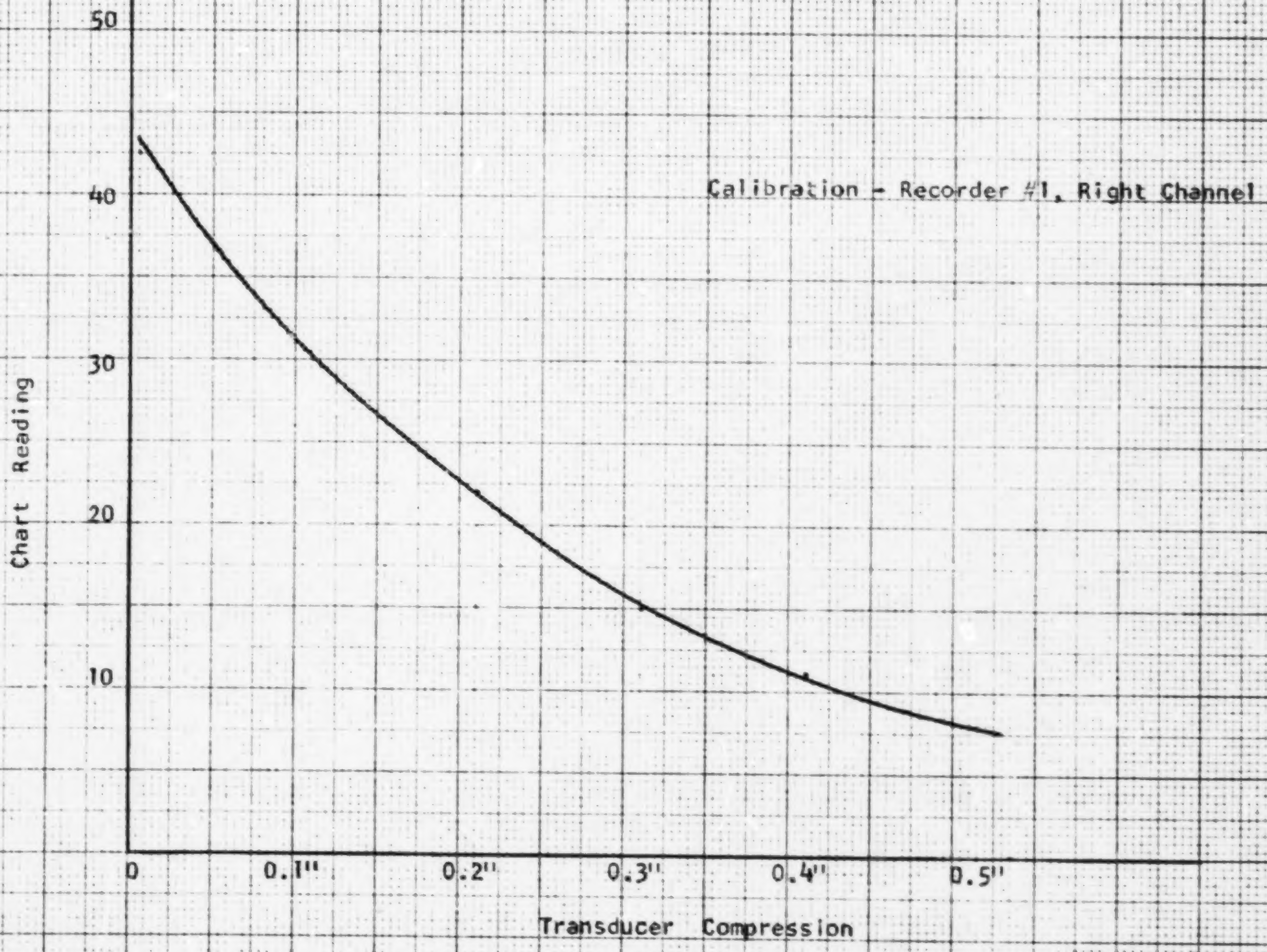

Calibration - Recorder #1, Right Channel

Figure V - 151

K•E 10 X 10 TO ½ INCH 7 X 10 INCHES KEUFFEL & ESSER CO. MADE IN U.S.A.

46 1320

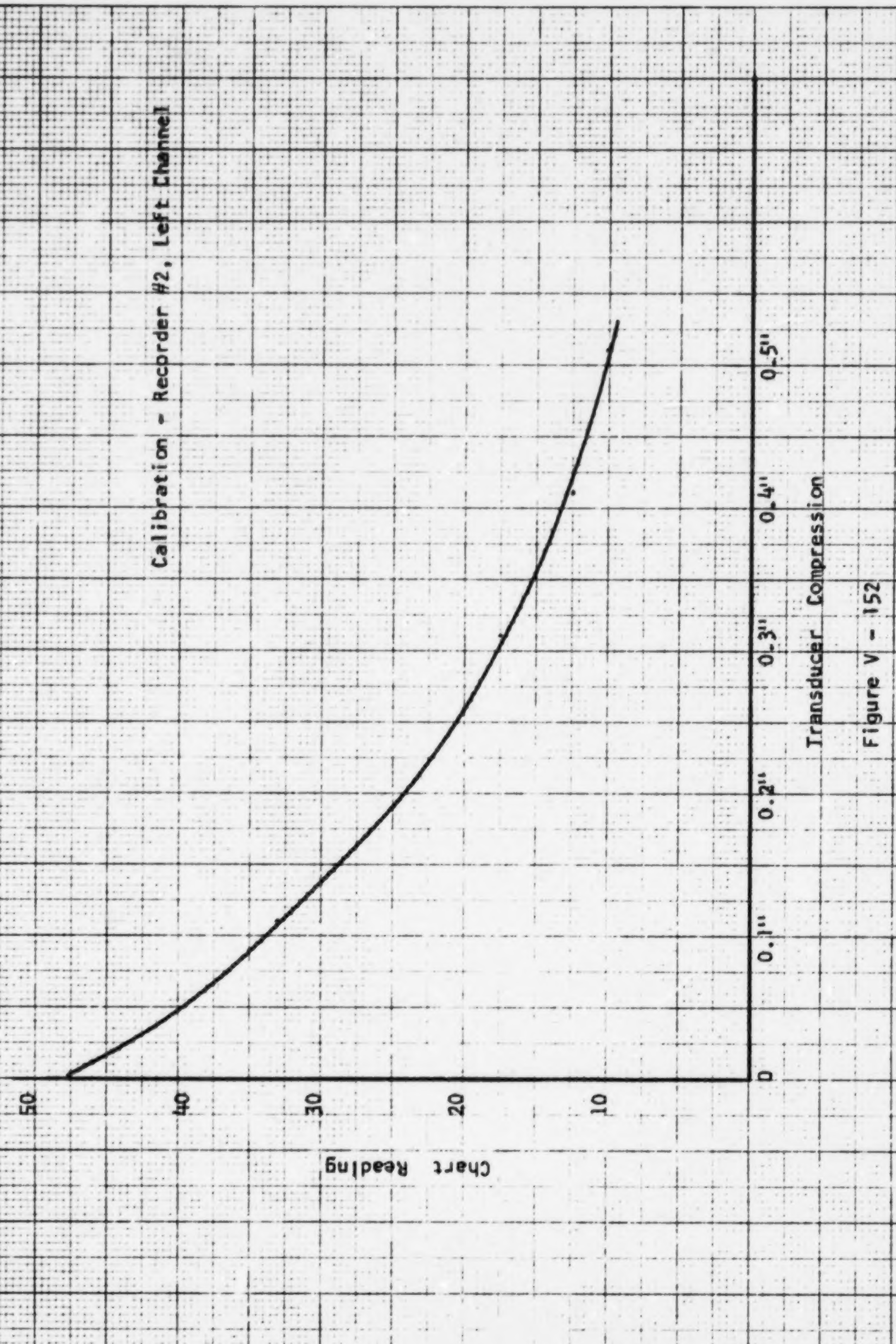
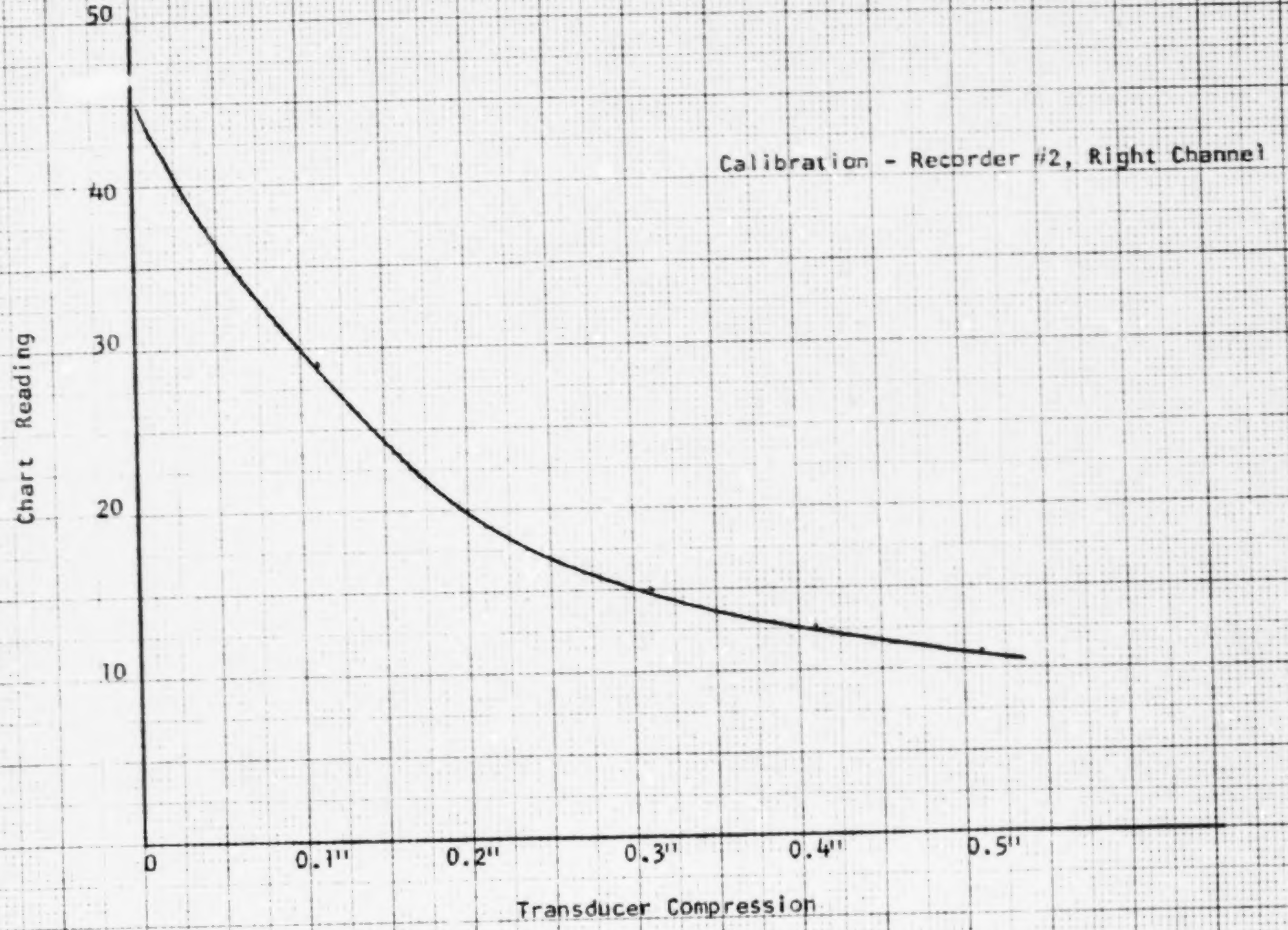


Figure V - 152

K•E 10 X 10 TO ½ INCH 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 1320

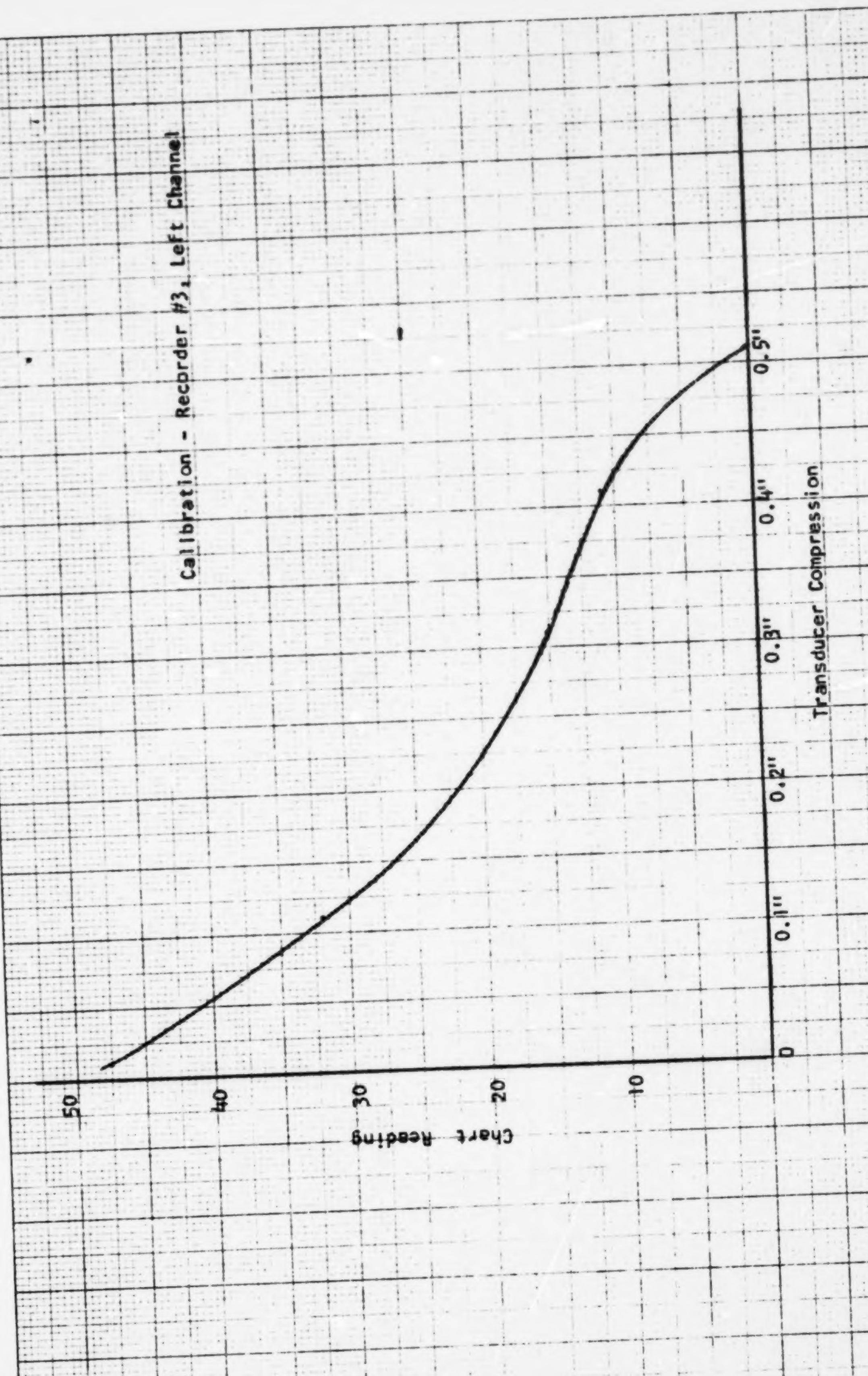


Calibration - Recorder #2, Right Channel

Figure V - 153

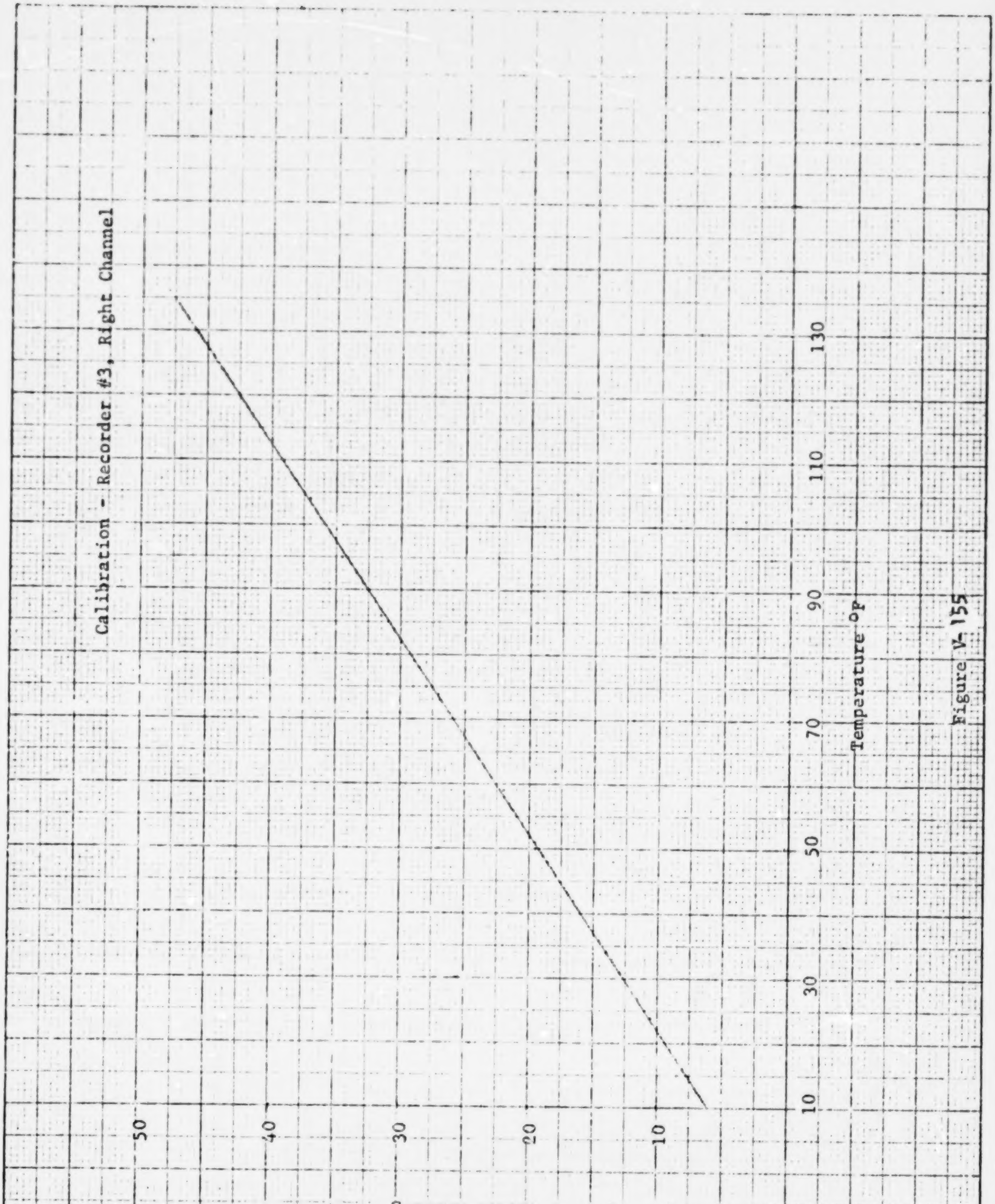
K·E 10 X 10 TO ½ INCH 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 1320



Calibration - Recorder #3, Left Channel

Figure V - 154



Calibration - Recorder #3, Right Channel

Figure V-155

K•E 10 X 10 TO ½ INCH 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 1320

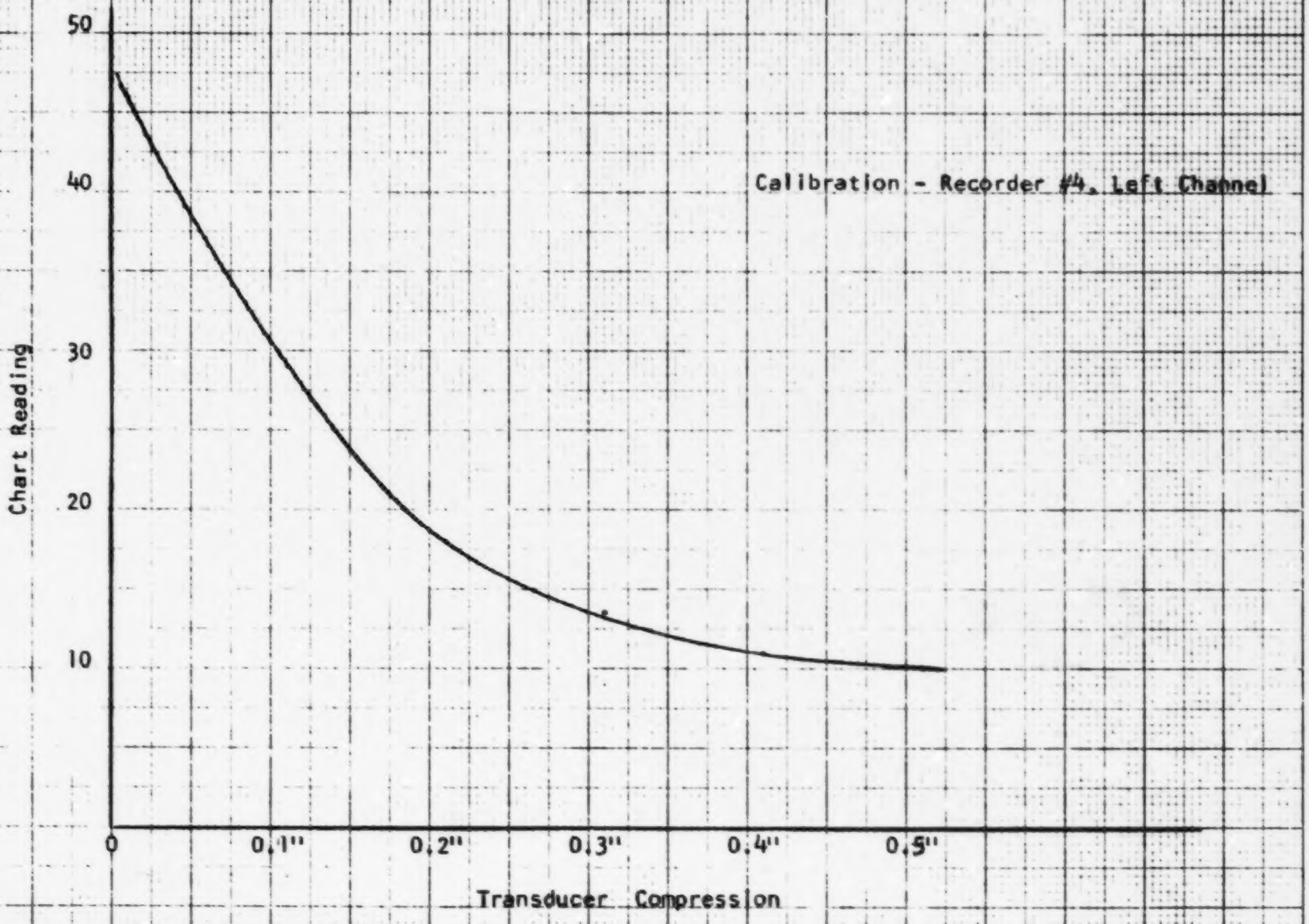
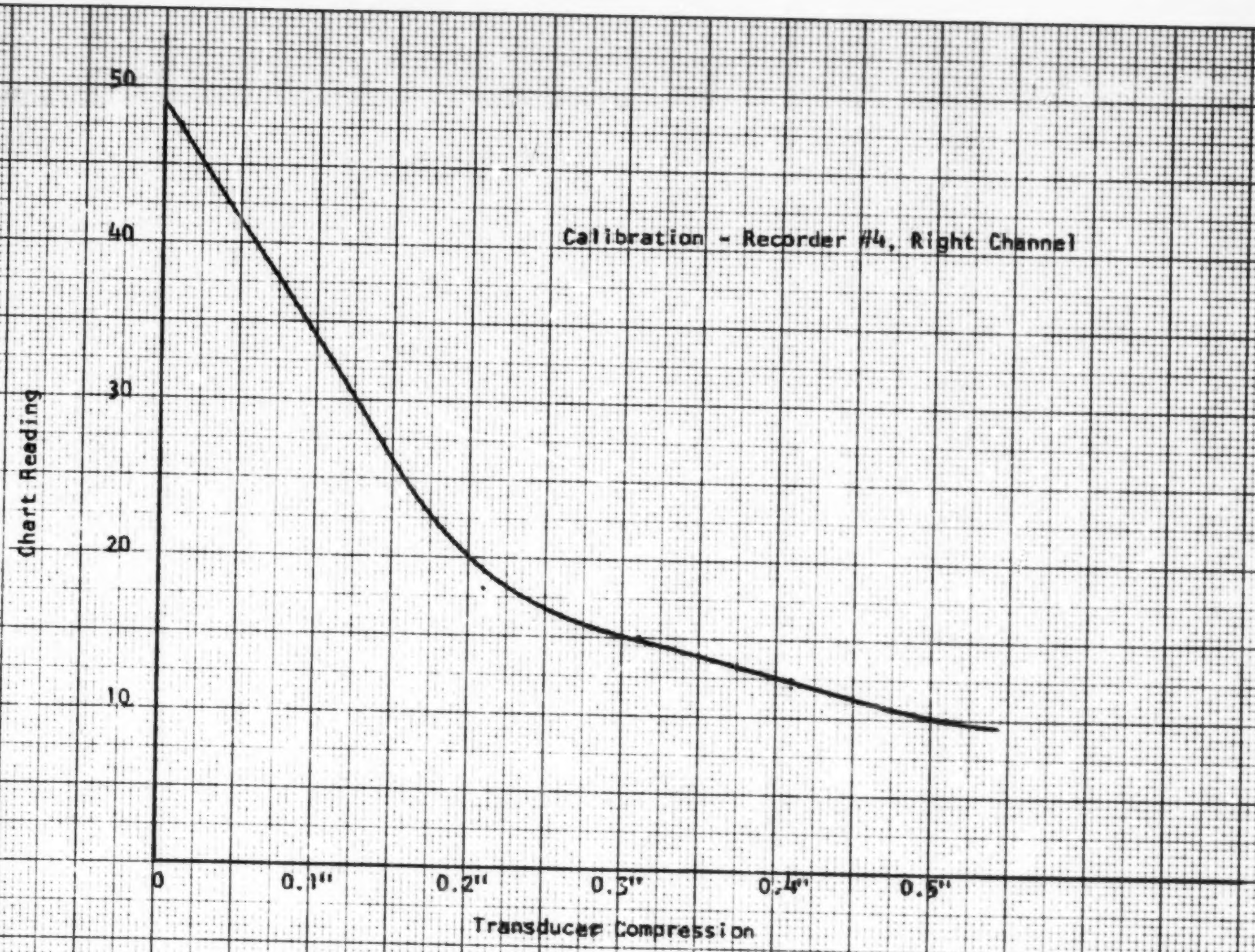


Figure V - 156

K•E 10 X 10 TO ½ INCH 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 1320



Calibration - Recorder #4, Right Channel

Figure V - 157

TEMPERATURE & WEATHER RECORD

Date	Temperature High	 Low	Precipitation - inches	Weather Note
7/16	85	66	0.5 Rain	Clear
7/17	84	61	None	Clear
7/18	86	62	None	Clear
7/19	88	66	None	Clear
7/20	78	72	Light shower	Cloudy
7/23	82	62	1.5 Rain (over weekend)	Cloudy
7/24	74	73	Rain pm	Cloudy
7/25	80	70	0.5 Rain	Cloudy
7/26	84	72	0.2 Rain	Partly cloudy
7/27	84	73	None	Clear to cloudy
7/30	79	58	None	Clear
7/31	78	65	None	Cloudy with rain pm
8/1/73	79	70	0.6 Rain	Cloudy
8/2	75	60	Trace rain	Partly cloudy to clear
8/3	78	58	None	Clear
8/6	84	62	None	Clear
8/7	83	64	None	Foggy to clear
8/8	92	66	None	Fog
8/9	92	70	None	Clear
8/10	85	68	.02	Partly Cloudy
8/11	89	70	0.17	Partly Cloudy
8/12	89	68	0.88	Thundershower
8/13	82	68	1.03	Thundershower, Windy
8/14	83	66	0.04	Thundershower
8/15	81	60	0.03	Partly Cloudy
8/16	87	60	None	Fog
8/17	87	60	None	Clear
8/18	84	61	Trace Rain	Fog, Partly Cloudy
8/19	84	62	0.27	Fog, Thundershower
8/20	85	55	0.15	Thundershower
8/21	77	52	None	Clear
8/22	78	48	None	Clear
8/23	82	60	Trace Rain	Partly Cloudy
8/24	76	60	0.10	Partly Cloudy
8/25	86	64	None	Clear
8/26	89	67	None	Clear
8/27	94	70	None	Fog
8/28	95	70	None	Fog
8/29	94	71	None	Fog
8/30	96	66	None	Thundershower, Windy
8/31	94	68	None	Thundershower, Windy
9/1/73	98	68	None	Clear
9/2	98	70	None	Clear
9/3	96	65	None	Clear
9/4	94	70	None	Fog
9/5	92	69	0.13	Fog, Thundershower
9/6	82	54	None	Clear
9/7	82	53	None	Clear
9/8	81	59	0.05	Partly Cloudy
9/9	73	50	.08	Partly Cloudy
9/10	79	48	None	Fog

Date	Temperature High	 Low	Precipitation - inches	Weather Note
9/11	79	48	None	Clear
9/12	77	49	None	Clear
9/13	79	60	0.11	Cloudy
9/14	77	50	0.03	Cloudy
9/15	80	54	None	Fog
9/16	80	52	None	Clear
9/17	81	50	0.46	Thundershower
9/18	60	41	None	Clear
9/19	67	44	None	Fog
9/20	74	54	None	Clear
9/21	78	63	None	Clear
9/22	85	63	0.26	Thundershower
9/23	83	57	Trace Rain	Cloudy
9/24	86	61	None	Clear
9/25	87	63	None	Clear
9/26	85	57	None	Clear
9/27	88	65	None	Clear
9/28	87	67	None	Clear
9/29	84	64	0.22	Thundershower
9/30	79	65	0.24	Thundershower
10/1/73	73	62	1.27	Thundershower
10/2	78	56	Trace Rain	Cloudy
10/3	78	60	Trace Rain	Fog
10/4	83	53	0.49	Thundershower
10/5	74	42	None	Clear
10/6	74	51	0.02	Partly Cloudy
10/7	76	62	Trace Rain	Partly Cloudy
10/8	79	58	None	Clear
10/9	80	55	None	Fog
10/10	81	52	None	Fog
10/11	80	56	None	Fog
10/12	81	56	None	Clear
10/13	68	52	0.34	Windy
10/14	74	48	None	Clear
10/15	81	49	None	Windy
10/16	64	35	None	Windy
10/17	62	46	None	Frost
10/18	65	34	None	Windy
10/19	70	53	None	Frost
10/20	72	36	None	Clear
10/21	72	35	None	Frost
10/22	74	41	None	Frost
10/23	78	41	None	Frost, Fog
10/24	79	41	None	Fog
10/25	80	45	None	Fog, Windy
10/26	72	38	None	Clear
10/27	70	51	0.14	Fog, Cloudy
10/28	52	38	0.48	Cloudy
10/29	49	40	0.73	Windy, Showers

Date	Temperature High	Temperature Low	Precipitation - inches	Weather Note
10/30	52	47	0.05	Windy, Cloudy
10/31	52	42	0.46	Windy, Showers
11/1/73	58	40	None	Windy
11/2	64	37	0.04	Windy, Cloudy
11/3	58	30	None	Windy
11/4	56	35	0.16	Freeze, Frost
11/5	47	25	None	Frost
11/6	47	23	None	Windy
11/7	47	29	0.17	Cloudy
11/8	49	30	None	Clear
11/9	36	21	None	Windy, Frost
11/10	40	20	None	Frost
11/11	47	24	None	Frost
11/12	53	46	None	Frost
11/13	66	58	None	Windy
11/14	68	60	None	Gusty
11/15	68	38	0.48	Thundershower
11/16	44	23	Trace Rain	Windy
11/17	50	33	None	Clear
11/18	54	46	None	Clear
11/19	60	36	None	Clear
11/20	61	50	0.05	Cloudy
11/21	58	39	0.06	Windy
11/22	67	38	None	Clear
11/23	66	52	0.05	Cloudy
11/24	64	58	0.85	Thundershower
11/25	61	39	0.27	Thundershower, Gusty
11/26	61	58	0.82	Shower
11/27	65	57	0.82	Shower
11/28	55	34	0.06	Gusty
11/29	41	38	None	Clear
11/30	60	31	None	Gusty
12/1/73	52	28	None	Clear
12/2	60	42	None	Clear
12/3	64	48	None	Clear
12/4	62	49	0.29	Snow, Windy
12/5	50	33	0.03	Snow, Windy
12/6	38	26	0.02	Clear
12/7	40	23	None	Clear
12/8	42	26	None	Clear
12/9	48	26	0.04	Snow, Windy
12/10	32	14	Trace Rain	Snow flurries
12/11	31	25	None	Clear
12/12	50	42	0.22	Snow
12/13	55	27	0.23	Snow, Windy
12/14	33	28	0.06	Snow, Windy
12/15	33	24	0.03	Snow
12/16	28	15	0.01	Windy, Snow
12/17	28	13	None	Clear
12/18	27	2[illegible]	Trace Rain	Snow Flurries
12/19	39	30	0.24	Snow
12/20	40	14	0.81	Windy, Snow
12/21	29	13	Trace Rain	Windy, Snow
12/22	31	15	None	Clear
12/23	42	35	0.02	Cloudy
12/24	50	42	0.01	Cloudy
12/25	53	47	0.06	Cloudy
12/26	57	39	0.41	Gusty, Thundershower
12/27	50	31	0.02	Gusty
12/28	46	35	None	Clear
12/29	47	20	0.32	Gusty
12/30	37	28	0.10	Snow
12/31	34	18	Trace Rain	Cloudy
1/1/74	24	8	None	Windy, Clear
1/2	30	22	.02	Ice Storm
1/3	30	20	.33	Ice Storm
1/4	25	18	None	Clear
1/5	32	22	.01	Snow
1/6	31	27	.01	Snow
1/7	30	9	Trace Rain	Snow
1/8	34	24	.44	Snow
1/9	37	29	.41	Ice Storm, Snow
1/10	35	31	.74	Ice Storm, Snow
1/11	36	15	.06	Snow
1/12	18	10	Trace Rain	Windy, Snow
1/13	31	26	Trace Rain	Snow
1/14	42	29	.02	Cloudy
1/15	58	38	None	Windy
1/16	59	44	Trace Rain	Windy
1/17	51	35	None	Clear
1/18	61	56	.34	Snow
1/19	59	48	.06	Clear
1/20	63	50	.17	Clear
1/21	52	42	Trace Rain	Cloudy
1/22	62	52	Trace Rain	Windy
1/23	55	31	.30	Snow
1/24	44	24	None	Clear
1/25	52	35	None	Fog
1/26	62	52	.16	Windy
1/27	61	35	None	Windy
1/28	54	36	.40	Snow, Windy, Fog
1/29	45	28	Trace Rain	Partly Cloudy
1/30	58	40	None	Clear
1/31	60	25	None	Windy
2/1/74	52	31	.20	Snow
2/2	39	28	Trace Rain	Partly Cloudy
2/3	33	22	None	Snow
2/4	25	15	None	Windy, Snow
2/5	31	21	.06	Snow
2/6	47	22	.54	Thundershower

Date	Temperature		Precipitation - inches	Weather Note
	High	Low		
2/7	29	22	Trace Rain	Snow
2/8	28	18	.01	Snow
2/9	26	16	.02	Snow
2/10	31	16	.20	Windy, Snow
2/11	32	28	None	Windy
2/12	50	48	None	Clear
2/13	60	32	None	Windy
2/14	33	18	None	Clear
2/15	43	25	None	Clear
2/16	48	27	None	Clear
2/17	47	23	None	Windy
2/18	56	40	.20	Clear
2/19	55	33	.40	Thundershower
2/20	48	28	None	Clear
2/21	61	52	.32	Windy
2/22	55	24	.04	Snow, Gusty
2/23	42	24	None	Clear
2/24	34	13	.18	Snow
2/25	22	13	Trace Rain	Snow
2/26	34	22	None	Clear
2/27	53	44	None	Windy, Clear
2/28	50	32	.08	Windy, Thundershower
3/1/74	55	42	.43	Thundershower
3/2	65	53	None	Clear
3/3	76	62	None	Windy
3/4	72	45	.28	Windy, Cloudy
3/5	60	38	.15	Cloudy
3/6	65	55	Trace Rain	Partly Cloudy
3/7	78	56	.04	Cloudy
3/8	80	56	None	Clear
3/9	77	45	.17	Cloudy
3/10	54	36	None	Gusty
3/11	45	36	.17	Cloudy
3/12	53	23	Trace Rain	Gusty
3/13	41	21	None	Gusty
3/14	52	31	None	Clear
3/15	51	38	.81	Snow
3/16	42	31	.03	Gusty
3/17	43	32	None	Clear
3/18	53	42	Trace Rain	Cloudy
3/19	51	33	Trace Rain	Clear
3/20	57	37	.42	Snow
3/21	40	23	.06	Cloudy
3/22	50	33	None	Gusty
3/23	51	16	.48	Gusty, Snow
3/24	28	8	None	Gusty
3/25	41	27	None	Clear
3/26	58	31	None	Gusty
3/27	52	35	None	Clear
3/28	64	47	None	Clear
3/29	60	48	.86	Thundershower
3/30	51	34	.28	Thundershower
3/31	51	36	.01	Gusty
4/1/74	81	47	.45	Thundershower
4/2	70	49	None	Gusty
4/3	80	64	.43	Thundershower, Tornados
4/4	74	39	Trace Rain	Gusty, Cloudy
4/5	44	31	.11	Snow
4/6	50	36	None	Clear
4/7	61	43	.27	Gusty
4/8	46	28	.54	Snow
4/9	42	27	None	Gusty
4/10	59	44	None	Clear
4/11	75	56	None	Clear
4/12	71	57	Trace Rain	Gusty
4/13	78	58	.01	Cloudy
4/14	82	42	.03	Gusty
4/15	54	34	None	Clear
4/16	62	33	None	Clear
4/17	66	37	None	Clear
4/18	68	45	None	Clear
4/19	62	35	.02	Cloudy
4/20	76	48	None	Clear
4/21	79	62	Trace Rain	Cloudy
4/22	64	45	.52	Thundershower
4/23	48	36	.02	Cloudy
4/24	60	30	None	Clear
4/25	64	44	None	Clear
4/26	75	45	None	Clear
4/27	82	57	None	Clear
4/28	84	68	None	Gusty
4/29	84	63	None	Gusty
4/30	81	47	.44	Thundershower
5/1/74	72	49	None	Clear
5/2	60	58	.85	Thundershower
5/3	68	42	.01	Windy
5/4	66	41	None	Frost
5/5	67	49	None	Clear
5/6	54	31	None	Windy
5/7	59	44	None	Clear
5/8	61	53	.24	Thundershower
5/9	55	45	Trace Rain	Cloudy
5/10	67	48	None	Clear
5/11	83	54	.57	Thundershower
5/12	70	46	.14	Windy
5/13	72	48	None	Clear
5/14	85	64	.07	Cloudy
5/15	74	53	Trace Rain	Cloudy
5/16	85	73	None	Fog
5/17	89	64	1.50	Thundershower
5/18	82	60	Trace Rain	Cloudy
5/19	79	56	None	Clear
5/20	86	62	None	Clear
5/21	85	68	None	Clear

Date	Temperature High	Temperature Low	Precipitation - inches	Weather Note
5/22	77	62	.87	Thundershower
5/23	81	60	.06	Cloudv
5/24	76	51	None	Clear
5/25	67	46	None	Clear
5/26	71	46	None	Clear
5/27	74	45	None	Clear
5/28	73	66	.10	Cloudy
5/29	77	61	.63	Thundershower, Windy
5/30	79	65	.21	Thundershower, Fog
5/31	74	67	1.18	Thundershower
6/1/74	66	50	.02	Cloudy
6/2	78	52	None	Clear
6/3	81	58	None	Clear
6/4	83	63	None	Clear
6/5	83	66	None	Clear
6/6	84	64	.38	Thundershower
6/7	86	69	Trace Rain	Cloudy
6/8	82	67	.28	Thundershower
6/9	86	75	None	Windy
6/10	80	59	.02	Windy
6/11	78	54	.06	Windy
6/12	74	49	.01	Cloudy
6/13	79	50	None	Fog
6/14	82	64	.18	Cloudy
6/15	81	58	.25	Thundershower
6/16	75	53	.24	Thundershower
6/17	70	50	None	Fog
6/18	78	58	None	Clear
6/19	78	60	.13	Cloudy
6/20	89	68	.43	Thundershower
6/21	84	67	.01	Cloudy
6/22	77	56	4.02	Thundershower, Flash Flood
6/23	66	50	.16	Thundershower
6/24	74	52	None	Clear
6/25	72	51	.11	Thundershower
6/26	69	50	.01	Fog
6/27	76	60	Trace Rain	Fog
6/28	68	60	.08	Cloudy
6/29	77	60	None	Windy
6/30	83	64	.08	Windy
7/1/74	89	62	None	Clear
7/2	89	68	None	Clear
7/3	92	70	None	Clear
7/4	90	66	.55	Thundershower
7/5	83	64	Trace Rain	Cloudy
7/6	88	67	None	Clear
7/7	91	69	None	Fog
7/8	93	69	None	Fog
7/9	90	72	None	Fog
7/10	91	70	.51	Thundershower
7/11	88	55	None	Clear
7/12	85	55	None	Clear
7/13	89	59	None	Clear
7/14	90	72	None	Clear
7/15	88	60	.11	Clear
7/16	87	55	None	Clear
7/17	87	60	None	Clear
7/18	89	73	None	Clear
7/19	85	66	.07	Thundershower
7/20	87	56	None	Clear
7/21	86	57	None	Clear
7/22	85	68	None	Clear
7/23	83	64	.03	Fog
7/24	82	59	Trace Rain	Fog
7/25	86	64	None	Fog
7/26	88	64	None	Fog
7/27	90	68	None	Fog
7/28	89	66	None	Thundershower, Fog
7/29	89	56	1.68	Thundershower, Fog
7/30	83	56	None	Clear
7/31	85	60	None	Clear
8/1/74	87	59	None	Clear
8/2	88	64	.64	Thundershower, Fog
8/3	81	64	.82	Thundershower
8/4	80	55	.02	Cloudy
8/5	81	56	None	Clear
8/6	83	61	None	Fog
8/7	84	62	.54	Thundershower
8/8	84	67	.07	Fog
8/9	88	64	Trace Rain	Fog
8/10	83	69	None	Fog
8/11	78	68	.38	Thundershower
8/12	87	64	.01	Cloudy
8/13	89	62	Trace Rain	Windy
8/14	88	64	None	Clear
8/15	84	64	None	Clear
8/16	88	69	.34	Thundershower
8/17	85	66	None	Clear
8/18	82	60	None	Fog
8/19	86	60	None	Fog
8/20	88	63	None	Fog
8/21	86	60	None	Fog
8/22	85	61	None	Fog
8/23	87	64	None	Fog
8/24	88	71	None	Fog
8/25	85	65	.26	Thundershower
8/26	88	66	None	Fog
8/27	89	70	.86	Thundershower
8/28	78	67	1.36	Thundershower
8/29	88	67	2.85	Thundershower
8/30	83	68	Trace Rain	Cloudy
8/31	82	68	.05	Cloudy